41 Topicwise Papers Solved

From October 2003 till the date

including March 2024

TPS

COMPUTER SCIENCE-II

including

Distribution of Marks Questionwise & Topicwise

STD. XII

KINNARI PRAKASHAN

MUMBAI-8

TPS

COMPUTER SCIENCE – II

(41 TOPICWISE PAPERS SOLUTION FROM OCT. 2003 TO MARCH 2024)

STD. XII

INCLUDING MARCH 2024

Prof. Preyas D. Chinchure

&

Prof. (Mrs.) Shweta A. Jawale

M.Sc. (Computer Science)

Ex. Lecturer M.J.College, Jalgaon

Edited by

Mrs. Aarti Yogesh Patil

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KINNARI PRAKASHAN

8, Santoshi Mata C.H.S., Dr. D.B. Marg, Mumbai – 8. Cell : 98901 33079, 98606 45722

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Computer Science - II - Contents

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	1	1	4	12	2	8			21
2	Instruction Set and Programming of 8085	1	1	4	12			6	30	43
3	Introduction of Microcontroller	1	1	1	3	1	4			8
4	Networking Technology	1	1	3	9	2	8			18
	Total	4	4	12	36	4	24	6	30	94

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Chapter 1

Introduction to Microprocessors and Organization of 8085

Probable marks : 21

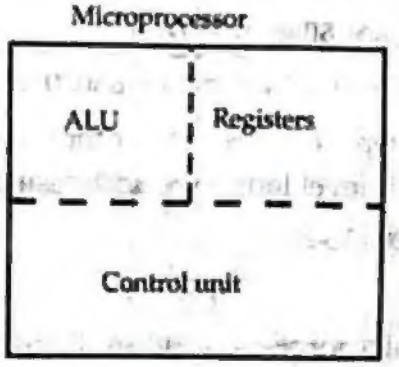
Scope of the syllabus :-

- Evolution of microprocessors.
- What is microprocessor ?
- Block diagram of generic microprocessor and study of various blocks in it.
- Block diagram of 8085 microprocessor.
- Study of various blocks and functions of various pins in 8085 microprocessor.

Q. 1 What is microprocessor ? List its functions. (March 2017)

Ans. :

1) Microprocessor is a semiconductor, multipurpose, programmable logic device that reads binary instructions from a storage device called memory, accepts binary data as input and processes data according to the instructions and provides result as output.
2) The electronic logic circuits in microprocessor are capable of performing various computing functions and making decisions to change the sequence of program execution.
3) Microprocessor can also be viewed as an integrated circuit, that contains processing capabilities of large computers.
4) A microprocessor can be roughly divided into three parts :



1. Arithmetic and logic unit (ALU)
2. Registers
3. Control unit

A.L.U is arithmetic and logic unit, where arithmetical and logical operations are carried out. Registers are primarily used to store data temporarily during execution of program. Control unit provides timing and control signals to the whole system. It also controls flow of data.

5) The functions of microprocessor are given below :
   a) To fetch, decode and execute instructions.

b) To transfer data from one block to another block or from one block to I/O lines.

c) To give proper response to different externally produced interrupts according to their priority.

d) To provide control and timing signals to the whole system according to the instructions.

Q. 2 Write a short note on evolution of microprocessor giving one example of each generation. (March 2002, 03, 04, 05, 08; Oct. 2003, 04, 07,09, March 2020)

Ans. : The evolution of microprocessor can be explained by following five generations :

(i) First generation :

(a) **Intel's 4004** was the first microprocessor available in the market. It was a four bit pmos microprocessor introduced in 1971, designed to be used in calculators.

(b) In 1972, Intel introduced first general purpose 8-bit microprocessor Intel **8008**.

(c) It was followed by **Intel's 8080** in 1973 and **Motorola's 6800** in the same year.

e.g. Intel's 4004 (4-bit), 8008 (8-bit)

Motorola's 6800 (8-bit)

(ii) Second generation :

(a) In 1974, **Intel's 8080, Zilog's Z-80, Motorola's M6800** were introduced. All these were 8-bit microprocessors.

(b) During second generation, the development of microprocessor has been in a direction to complete microprocessor system (microcontroller) i.e. CPU, ROM, RAM, clock, I/O ports all in single package.

(c) In 1976, **INTEL's 8085**, 8-bit microprocessor was introduced.

(d) In 1977, 12-bit microprocessor **Intersil's IM6100** and **Toshiba's T8190** developed.

eg. INTEL's 8085 (8-bit)

Zilog's Z80 (8-bit)

(iii) Third generation :

(a) Intel introduced first 16-bit microprocessor **8086** in 1978.

(b) It was followed by **Zilog's Z-8000** in 1979 and **Motorala's 68000** in 1980.

(c) In third generation, memory space was 64 KB. The other features were full arithmetic execution and efficient higher level language addressing.

e.g. Intel's 8086 (16-bit), Zilog's Z-8000 (16-bit)

(iv) Fourth generation :

(a) In 1981, Intel introduced first 32-bit microprocessor **80386**. It can address physical memory of 4 GB.

(b) Other 32-bit microprocessor **Hewlett Packard's HP-32** announced in 1982.

(c) In 1987, **Motorola's 68020**, a 32-bit microprocessor introduced.

e.g. INTEL 80386 (32-bit)

INTEL 80486 (32-bit)

(v) Fifth generation :

(a) Intel made improvement in microprocessor design to provide greatest speed.

(b) Also system can run on new OS like UNIX, LINUX etc.

(c) The processor in this generation is called **Pentium**. It is 64-bit microprocessor. e.g. Intel 80586, Intel Pentium IV.

Q. 3 Draw a neat block diagram of microcomputer system ? Explain each block function in brief. (Mar. 1998, 03, 19, Oct. 2008)

Ans. : Block Diagram of Microcomputer :

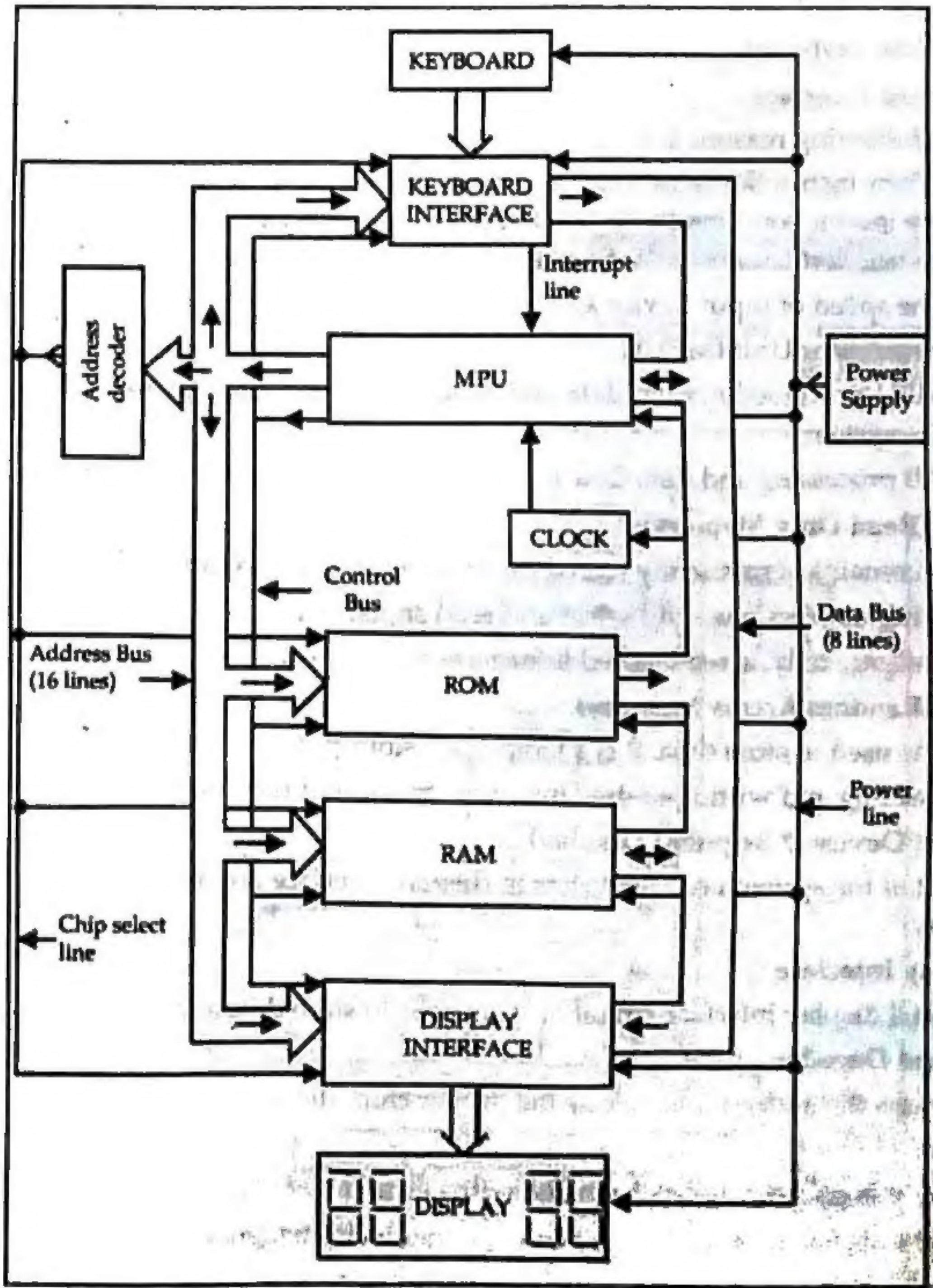


Fig. 1.1

Microcomputer mainly contains following blocks :

1) Input device (keyboard)
2) Microprocessor Unit (MPU)
3) Program memory (ROM)
4) Data memory (RAM)
5) Output device (7-segment display)

Fig.1.1 shows detail architecture of a microcomputer with all essential bus and control signal lines.

1) Input Device (Keyboard) :

The instructions as well as data prepared for particular program are entered through input device like keyboard.

2) Keyboard Interface :

Due to following reasons it is necessary to connect keyboard to keyboard interface :

i) When instruction and data is entered through keyboard, it is not possible to feed the instruction directly to MPU because MPU may be busy in performing previous instruction or other task. So it is stored in a special chip called keyboard interface.

ii) The speed of input device and MPU may not be equal.

Microprocessor Unit (MPU) :

i) MPU processed system data and required control signals are generated to control the system.

ii) All processing and data flow is done in the system with MPU chip.

ROM (Read Only Memory) :

i) It contains permanently stored program known as monitor program.

ii) It has address bus, chip select and read signal line.

iii) It allows only to read stored information.

5) RAM (Random Access Memory) :

i) It is used to store data, it is a temporary storage device.

ii) Reading and writing of data into memory, so bidirectional data bus is required.

6) Output Device (7 Segment Display) :

Output of the system i.e. stored data in display interface are displayed on seven segment display.

7) Display Interface :

A special display interface circuit or IC is used to store data and drive the display.

8) Address Decoder :

It decodes the address and selects the proper chip (device).

9) Clock :

i) Whole circuitry is synchronized with clock.

ii) The speed of the system depends on the clock frequency.

10) Power Supply :

Power supply is necessary to operate the circuit.

Fig.1.1 also shows following important lines : **(Oct. 2007)**

1) **Interrupt line :** used to interrupt the MPU.
2) **Address bus :** 16-bit address bus (unidirectional) from the MPU used to flow bits of required memory to devices.
3) **Data bus :** 8-bit bidirectional data bus used to transfer data among MPU and devices.
4) **Control bus :** It carries control signals generated by MPU.
5) **Power line :** It is necessary to operate the circuit.

Q. 4 List any three primary functions of CPU of microcomputer.

(March 2002, 2004, 2006, 2008, Oct. 2003, 2005; July 2017)

Ans. : The primary functions of the CPU of a microcomputer are -

a) To fetch, decode and execute program instructions in the proper order.
b) Transfer data to and from memory and to and from the input/output sections.
c) Responds to external interrupts.
d) Provide overall timing and control signals for the entire system.

Q. 5 Draw a labelled block diagram of generic microprocessor. Explain its functional units. **(March 05; Oct. 2003, 2006, 2007; June 2016)**

OR

Q. 5 Draw a neat simplified block diagram of CPU architecture of micro-computer.

(March 09; Oct -2010)

Ans. : Block Diagram of Generic Microprocessor :

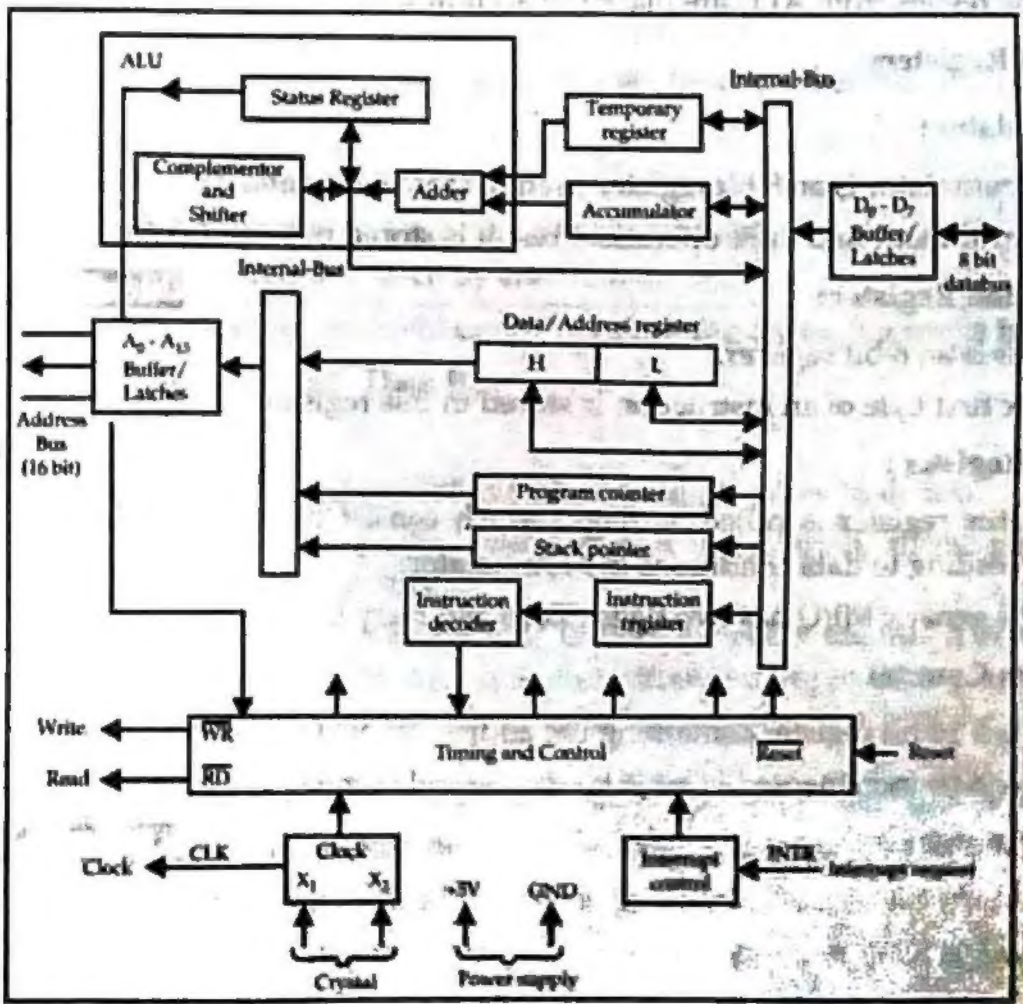


Fig. 1.2 : Functional Block Diagram of Generic Microprocessor

Microprocessor is a primary functioning unit.

Fig.1.2 shows the detailed block diagram of generic microprocessor i.e. general microprocessor.

It consists of following blocks :

i) Arithmetic and Logic unit.

ii) Several registers - Instruction register, Accumulator, Stack pointer, Status register, Temporary register, Data/Address register.

iii) Program counter.

iv) Instruction decoder.

v) Timing and control section.

vi) Bus buffer and Latches.

vii) Interrupt control.

i) Arithmetic and Logic Unit :

a) This unit performs arithmetic and logic operations.

b) This unit also performs rotate operation.

c) The operations in this unit affects the status register.

d) The results from ALU are placed in accumulator.

ii) Several Registers :

a) Accumulator : (March 2019)

a) Accumulator is an 8-bit register used to store 8-bit data.

b) In arithmetic and logic operation, result is stored in accumulator.

b) Instruction Register : (March 2019, Dec. 2020)

a) This is an 8-bit register.

b) The first byte of an instruction is stored in this register.

c) Status Register : (March 2017)

a) Status register is called as flags, which consist of flip-flops that are set or reset according to data conditions in accumulator.

b) The generic MPU has two flags : Zero and carry flag.

d) Program Counter :

a) It is a 16-bit register containing the address of next executable instruction.

b) It can be incremented or reset by the control section.

e) Stack Pointer : (Dec. 2020, March 2022)

a) It is a16-bit register consisting of address of memory location called stack.

b) Stack is R/W memory used for temporary storage.

f) Data/Address register / HL Register Pin : **(Dec. 2020)**

a) The data/address register is a two 8-bit registers that can be used separately or as a combined pair. They are labelled as H and L.

b) Data is stored in these registers. When used in pair, 16 bit address can also be stored.

iii) Instruction Decoder : **(June 16, March 17, 19, 22)**

a) This interpretes the content of instruction register and determines exact steps to be followed in executing the entire instruction.

b) It directs the control section accordingly.

iv) Timing and Control Unit :

a) This section receives the signals from the instruction decoder to determine the nature of instruction to be executed.

b) Timing and control signals are sent to all parts of microprocessor.

v) Address Bus :

a) The address bus is a group of 16 lines generally identified as A_0 to A_{15}.

b) It is a unidirectional bus i.e. bits flow in one direction from MPU to peripheral devices.

vi) Data Bus :

a) Data bus is a group of 8-bits used to data flow.

b) It is a bidirectional bus i.e. data flows in both directions between MPU and memory and peripheral.

vii) Bus buffer and Latches :

a) Latch is a flip-flop used to store one bit of information.

b) Information is stored into latch by enabling buffer.

Q. 6 In case of a Microprocessor Architecture, explain the following terms in brief :

(i) Address Bus **(ii) Data Bus**

(iii) Control Bus **(March 2012)**

OR What do you mean by BUS in 8085 is µP? Explain it's types in detail? **(Oct. 2021)**

Ans. : Bus is group of conducting wires which carries information, all the peripherals are connected to microprocessor through bus.

(i) Address Bus : The address bus is group of 16 lines generally identified as A_0 to A_{15}. It is unidirectional i.e bits flow in one direction from microprocessing unit (MPU) to peripheral devices. The MPU uses the address bus to identify a peripheral or memory location.

(ii) Data Bus : The data bus is a group of 8 lines used for data flow. These lines are bidirectional i.e. data flow in both directions between MPU and memory and peripheral devices. MPU uses data bus for transferring data.

(iii) Control Bus : Control bus provides necessary timing and control signals to all the operations in microprocessor. It controls the flow of data between microprocessor, memory and peripherals. Control signals in bus are $IO/\overline{M}$, $\overline{RD}$, $\overline{WR}$.

Q. 7 Give the features of microprocessor 8085. (March 2008, 20)

OR Explain any six features of 8085 microprocessor? (Oct. 2021)

Ans. : The main features of microprocessor 8085 are as listed below :

1) Intel's 8085 is an 8-bit microprocessor, 8-bit data bus width indicates that 1 byte of data can be passed on this bus.
2) 8085 chip is available in 40 pin plastic ceramic DIP package.
3) It has 16 bit address bus that means it can address a physical memory of 64 kilo bytes.
4) Address bus is divided into two groups. The least significant 8 bits of address bus are transferred on same eight lines of the data bus. Such bus is called multiplexed bus. Most significant bits of address are transmitted on address bus.
5) To select external memory or I/O devices, microprocessor 8085 uses I/O mapped I/O system.
6) To communicate with external devices, microprocessor 8085 used interrupt method. (Hardware interrupt)
7) The microprocessor requires +5V single power supply and can operate with 3MHz single – phase clock.

Q. 8 Draw a functional pin diagram of microprocessor 8085. (March 99, Oct. 2004)

Ans. : 8085 chip is available in 40 pin plastic cermic D.I.P. package. i.e. 8085 pin diagram consists of 40 pins. The pin diagram of microprocessor 8085 is given below.

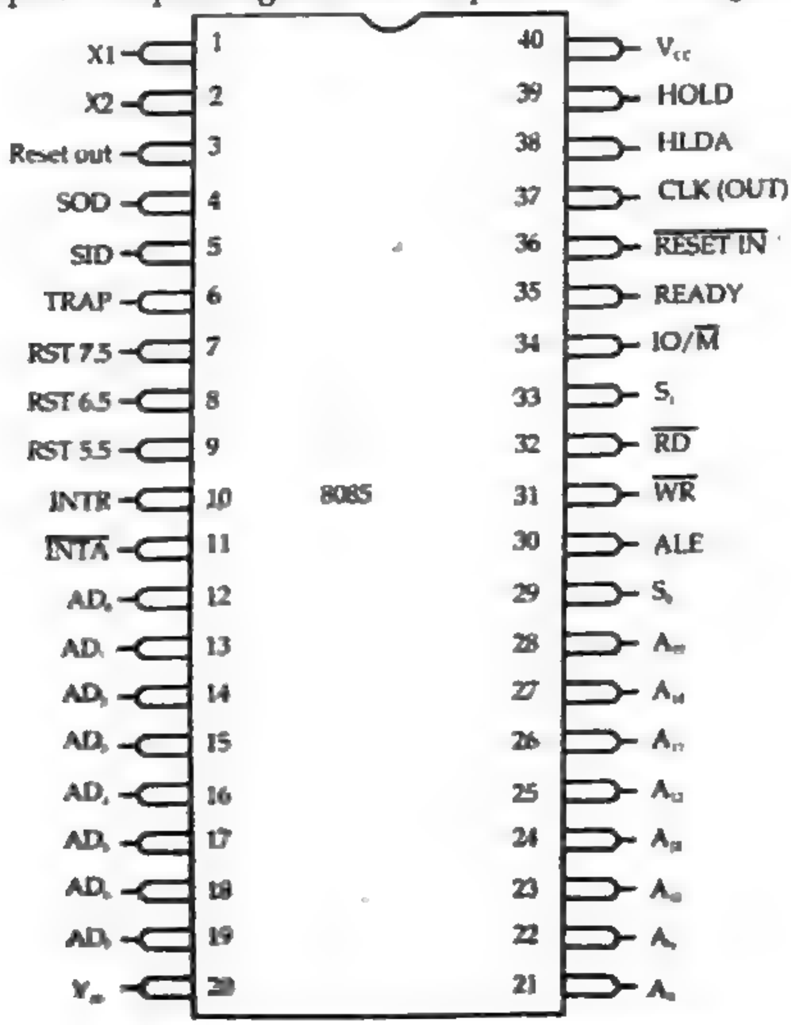


Fig. 1.3 Functional Pin Diagram of 8085

Q. 9 Explain the purpose of following pins in microprocessor 8085.

Ans. : (i) ALE : (March 1998, 05, 06, 09; Oct. 2002, 05, 07,09, 21, Dec. 2020)

1) Address Latch Enable, one special output signal generated by microprocessor to indicate beginning of the operation.
2) It is positive going pulse generated during first clock cycle of machine state and it indicates that the bits on AD_7 - AD_0 are address bits.
3) This signal enables the lower 8-bit of the address from the multiplexed bus to latch into external flip-flop or peripheral device. After AD_0 - AD_7 changes over to data bus.
4) ALE is never tristated.

(ii) $\overline{RD}$: (March 2006, 18, 20, Oct. 09)

1) This is read control signal. This is active low signal.
2) This signal indicates that selected I/O or memory device is to be read and data is available on data bus.
3) It is tristated during HOLD and HALT.

(iii) $\overline{WR}$: (Oct. 2002, March 2005, 2018; July 2019)

1) This is write control signal. This is also active low signal.
2) This signal indicates that the data on data bus are to be written into selected memory or I/O locations.
3) It is tristated during HOLD and HALT.

Q. 10 Describe in brief functions of following pins in 8085 microprocessor.

(a) HOLD (b) INTR (c) $\overline{\text{RESET IN}}$ (March 2002, Oct. 2008)

Ans. : (a) HOLD : (March 2003, 09, 11, 22; Oct. 98; July 18)

1) It indicates that a peripheral such as DMA (Direct Memory Access) controller is requesting the use of address and data buses.
2) Having received a HOLD request the microprocessor releases the use of the buses as soon as the current machine cycle is completed. Internal processing may continue.
3) The processor regains the bus after the removal of the HOLD signal.

(b) INTR : (July 2018, 19, Oct. 2021)

1) INTR is a level triggered maskable Interrupt Request input signal.
2) This is a general purpose interrupt with lowest priority.
3) When interrupt signal is given on this line, the microprocessor executes interrupt acknowledge cycle to read interrupt information from interrupting device.
4) When this arises, program counter does not increment its contents.
5) The INTR is enabled or disabled by software.

(c) $\overline{\text{RESET IN}}$: (March 2003, 09; Oct. 2007, Dec. 2020)

1) When the signal on this pin goes low, the program counter is set to 0000H.
2) The buses are tristated and microprocessor unit is held in reset condition as long as RESET is applied.
3) It also resets interrupt enable and HLDA flip-flop.

Q. 11 Describe the functions of following pins in 8085 microprocessor.

1) READY 2) RST 7.5 3) S_0, S_1 4) HLDA

Ans. : 1) READY : (March 2008, 11; Oct. 2003, 05,09,21; July 17, Dec. 2020)

a) It is a input signal used by the microprocessor to sense whether a peripheral is ready to transfer data or not.

b) This signal is used to delay the microprocessor until a slow responding peripheral is ready to send or accept data.

c) If READY is high, the peripheral is ready. If it is low, the microprocessor waits for an integral number of clock cycles until it goes high.

d) It is used to synchronize slower peripheral to faster microprocessor.

2) RST 7.5 : (Oct. 2003)

a) RESTART INTERRUPT : This signal is used to interrupt the microprocessor.

b) When an interrupt is recognized the next instruction is executed from a **fixed location** in the memory i.e. 7.5 × 8 = 003CH

c) It is **maskable** interrupt.

d) They cause an **internal restart** to be automatically insert.

3) S_0, S_1 : (Oct -2010)

a) These are status signals sent by microprocessor to distinguish the various operations or type of machine cycle in progress.

b) Status Code for Intel 8085 is :

S_1	S_0	Operations
0	0	HALT
0	1	WRITE
1	0	READ
0	1	FETCH

4) HLDA : (Oct. 2003,09, March 2004; July 17, 18, 19)

a) It is signal for HOLD ACKNOWLEDGEMENT.

b) A HLDA output indicates to a peripheral that a HOLD request has been received and that the microprocessor will relinquish control of buses in the next clock cycle.

c) After the removal of HOLD request HLDA goes low.

Q. 12 Explain following Pins of 8085 Micro-processor (Oct. 2012)

(i) CLK (out) (ii) $\overline{WR}$ (iii) RST 5.5

Ans. : Please refer chapter 1 Q. 16 & Q. 9 Pg. No. 1-12, & 1-9.

RST 5.5 : This signal is used to interrupt the microprocessor. When an interrupt is recognized the next instruction is executed from a fixed location in memory i.e. 002C H. it is maskable interrupt. It cause internal restart to be automatically insert.

Q. 13 Describe the functions of following pins of 8085 : (Oct. 2014)

(i) SID (ii) READY (iii) ALE

Ans. : (i) SID - 1. SID (Serial Input Data). It is a data line for serial input.

2. The 7^{th} bit of the accumulator is inputed on SID line when RIM instruction is executed.

3. The SID line eliminates the need of an output port in the software controlled serial I/O.

(ii) READY - Please refer Chapter 1 Q.11(i), Pg. No. 1- 10.

(iii) ALE - Please refer Chapter 1 Q. 9(i), Pg. No. 1- 9.

Q. 14 Explain functions of the following pins of 8085 Microprocessor : (March 2017)

(i) Multiplexed address/data bus pin (AD0 - AD7)

(ii) RST 6.5 (iii) CLK (OUT)

Ans. : **(i) Please refer Chapter 1 Q. 17/18, Pg. No. 1-12.**

(ii) Restart interrupt signal is used to interrupt the microprocessor. When an interrupt is recognised the next instruction is executed from a fixed location in memory i. e. $6.5 \times 8 = 0034$. It is maskable interrupt. The cause an internal restart to be automatically insert.

(iii) Please refer Chapter 1 Q. 16, Pg. No. 1-12.

Q. 15 Explain the functions of the following pins of 8085 :

Ans. :

(a) IO / $\overline{M}$: (March 2003, 04, 18, 19, 22, Oct 2010)

1) It is a status signal indicates whether the address bus is for I/O device or for memory.
2) When it goes high, the address on the address bus referring I/O device and when it goes low, the address on the address bus referring memory.
3) It is tristated during HOLD and HALT.

(b) TRAP : (Oct. 2002, March 2005)

1) This signal is used to interrupt the microprocessor. It has highest priority among interrupts.
2) When an interrupt is recognized the next instruction is executed from a fixed location in the memory i.e. 0024 H.
3) It is nonmaskable interrupt. It is unaffected by any interrupt enable or mask.

(c) SOD :

1) Serial Output Data. It is a data line for serial output. (Oct. 2007,09; July 17)
2) The 7^{th} bit of the accumulator is outputted on SOD line when SIM instruction is executed.
3) The SOD line eliminates the need for an output port in the software - controlled serial I/O.

Q. 16 Explain the functions of the following pins of 8085 : (March 2004, 11, 06; Oct. 05)

(1) Reset out (2) $\overline{INTA}$ (3) CLKOUT

Ans. : (1) RESET OUT :

(1) It indicates that the MPU is being reset.
(2) It is connected to peripherals to reset them when MPU is reset.

(2) $\overline{INTA}$: (March 19

(1) INTA is an Abbrevation for interrupt acknowledgment.
(2) A low an INTA indicates that the processor has acknowledged an INTR interrupt.

(3) CLKOUT : **(March 2017, 2020)**

(1) The whole circuitry is synchronized with clock

(2) The speed of the system depends on the clock frequency.

Q. 17 Describe functions of the following pins of 8085 :

Ans : i) X1, X2 **(March 2020)**

i) The X1 and X2 are connected to an external crystal or an RC or LC network which drives an internal circuitry of the microprocessor.

ii) It produce a suitable dock for the operation of microprocessor.

iii) The frequency is internally divided by two, therefore the crystal should operate twice the operating frequency.

iv) The operating frequency range of 8085 is 500 KHz to 3MHz

ii) AD_0 - AD_7 **(March 2017)**

Multiple Address/ Data Bus :

i) The signal lines AD_0 to AD_7 are bidirectional They Serve a dual purpose. They are used as the low - order address bus as well as the data bus.

ii) In executing an instruction, during the earlier part of the cycle, these lines are used as the low - order address bus. During later part of the cycle, these lines are used as the data bus

iii) However, the low-order address bus can be separated from these signals by using a latch.

iii) A_8 –A_{15}

i) The 8085 has 16 address lines

ii) The most - significant bits (A_8-A_{15}) of address bus are separate. The least significant bits A_0 - A_7 are time multiplexed with the bits of the bidirectional data bus D_0 -D_7

iii) The eight signal lines (A_8-A_{15}) which are unidirectional and used as the high - order address bus.

Q. 18 Explain multiplexed address/data bus in microprocessor 8085. **(March 2020)**

Ans. :

1) Microprocessor 8085 has 8-bit data bus and 16-bit address bus.

2) The least significant 8-bits of address bus are passed on the same eight lines as that of data bus i.e. on the signal lines AD_7 - AD_0.

3) These signal lines are bi-directional.

4) They are used for dual purpose for lower order 8-bit of address and as well as 8-bit of data. This is known as multiplexing and such bus is known as multiplexed bus.

5) To multiplexed means, first to select one and then other.

6) In executing an instruction, during earlier part of cycle these lines are used as the lower order address bus. During later part of cycle, these lines are used as data bus.

7) The 8085 has a special signal called ALE (Address Latch Enable) for informing the peripheral when the address/data bus is sending address and when it is functioning as a data bus.

8) If signal of pin ALE is high (i.e. 1), then the bits on AD_7 – AD_0 are address bits else they are data bits.

Q. 19 Explain the address and data bus structure of 8085 and explain how address and data is demultiplexed ?

Ans. :

1) With the added functions of the 8085, one 40 pin DIP did not have enough pins for all the inputs and outputs.
2) For that reasons the manufacturer uses pins 12 to 19 as **dual-purpose address/data bus lines (AD_0-AD_7)**. The unit is said to have an 8-bit multiplexed address/data bus.
3) The least significant 8 address lines share pins with the 8 data bus lines.
4) To multiplexed means to first select one and then another. Therefore to multiplexed address/data bus means to first use of the bus to send the address and next to send or receive data via same bus.
5) The 8085 have special signal for informing the peripherals when the address/data bus is sending on address and when the bus is functioning as data bus. The special signal is called the **Address Latch Enable (ALE) control signal**.

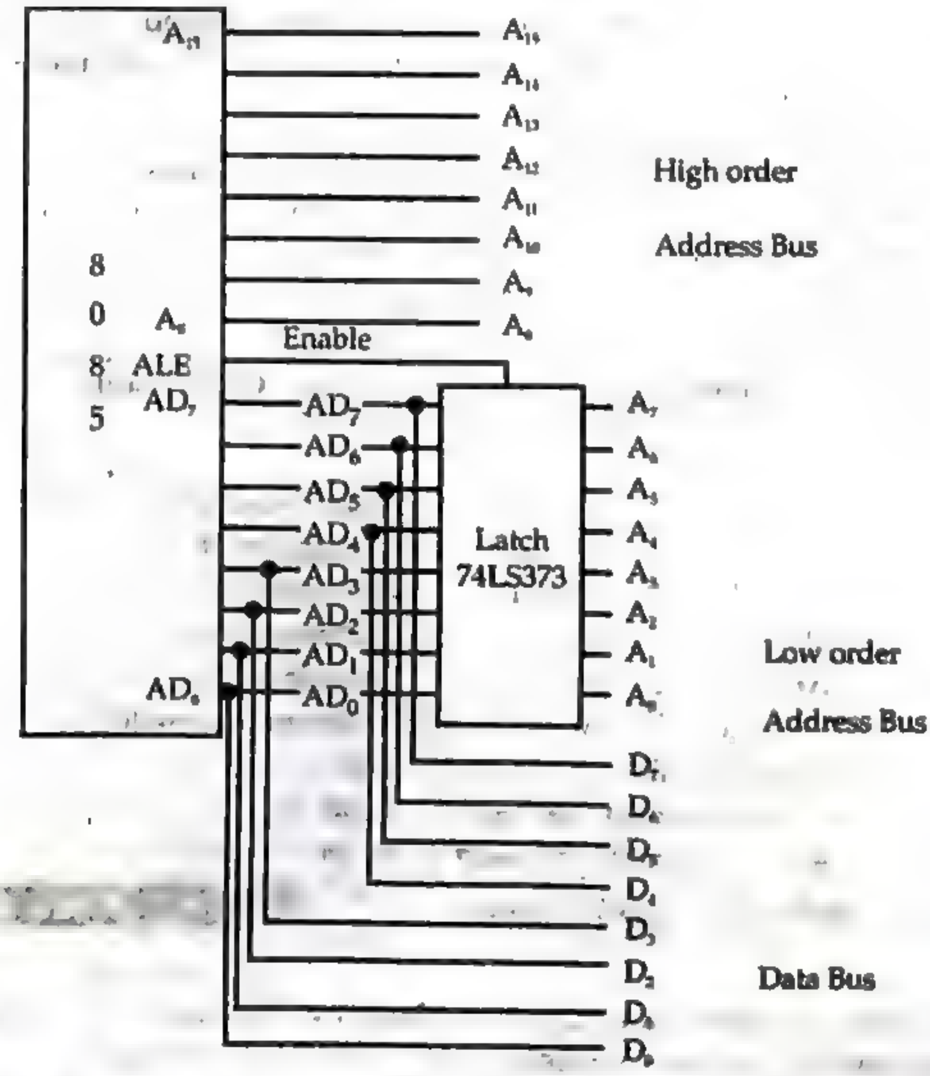


Fig. 1.4

6) During the first cycle, the address is sent out. The lower 8-bits are latched into the peripherals by the **Address Latch Enable**. During the rest of the machine cycle the data bus is used for memory or I/O data.

Q. 20 What are I/O mapped I/O and memory mapped I/O schemes ? Which one 8085 uses? OR Write a note on addressing I/O devices. March 17, July 17

Ans. : Microprocessor is connected to various other devices such as memory and I/O devices. There are two schemes by which these devices can be addressed :

I) Memory mapped I/O scheme :

1) In memory mapped I/O scheme, whenever an address appearing on address bus is for an I/O device, then there is no other information on corresponding memory location.
2) e.g. suppose address 0002 is for output device and whenever this address appears on address bus and is to be used to select output device, there is no information on memory location 0002.
3) In other words, when an address is used to select I/O device, then that address is not used for any memory location.

II) I/O mapped I/O : (Oct. 2006; July 2017)

1) In I/O mapped I/O, same address may be used for I/O device as well as for memory location.
2) Microprocessor 8085 uses I/O mapped I/O scheme to address I/O devices.
3) Using status signal, differentiation between I/O operations and memory operations is done.
4) When the signal is $IO/\overline{M}$ high, the address on the address bus is for an I/O device and when it is low, the address on the address bus is for a memory location.
5) The instruction IN and OUT are used to address I/O devices.
6) The various operations to be carried out are identified by using status signals S_0 and S_1 as follows :

Status Signals			Machine Cycle Status
$IO/\overline{M}$	S_0	S_1	
0	0	1	Memory write
0	1	0	Memory read
1	0	1	I/O write
1	1	0	I/O read
0	1	1	Opcode fetch
1	1	1	Interrupt acknowledge
floating	0	0	Halt
floating	unused	unused	Hold
floating	unused	unused	Reset

Q. 21 What is an interrupt ? Explain in detail. (Oct. 05, 07,09; July 17; March 18, 20

Ans. :

1) An interrupt is a subroutine called, initiated by external device through hardware (hardware interrupt) or microprocessor itself (software interrupt).
2) An interrupt can also be viewed as a signal, which suspends the normal sequence of microprocessor and then microprocessor gives service to that device which has given the signal. After completing the service, microprocessor again returns to the main program.
3) Microprocessor is connected to different peripheral devices. To communicate with these devices, microprocessor 8085 uses interrupt method.

4) An interrupt is an input signal, which transfers control to specific routine known as Interrupt Service Routine (ISR). After executing ISR, control is again transfer to main program.

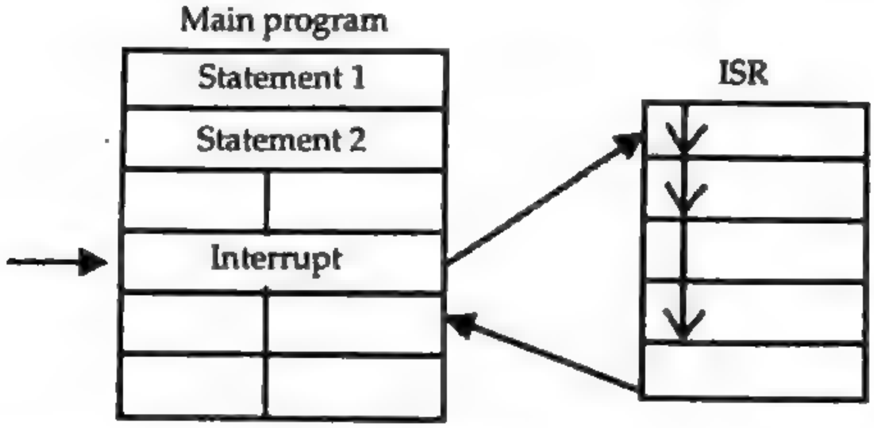


Fig. 1.5

5) Microprocessor 8085 has two types of interrupts :
(i) Software interrupt (ii) Hardware interrupt
The software interrupts has more priority than any hardware interrupt.

6) Software interrupts are not requested by external peripheral devices. All software interrupts are non-maskable. Some hardware interrupts are maskable.

Q. 22 Give all the hardware interrupts provided by 8085. List them according to their priority. (Oct. 04, 09, March 06, Oct. 10; June 16, March 17, 20; July 17)

Ans. :

1) 8085 provides 5 hardware interrupts :
(i) TRAP (ii) RST 7.5
(iii) RST 6.5 (iv) RST 5.5 (v) INTR

2) These interrupts are vectored interrupts. It means that when these interrupts are given, it is directed (or vectored) to transfer the control to specific memory location given by -
TRAP = 4.5 × 8 = 0024 H RST 7.5 = 7.5 × 8 = 003C H
RST 6.5 = 6.5 × 8 = 0034 H RST 5.5 = 5.5 × 8 = 002C H

3) Among these interrupts, TRAP is non-maskable interrupt which can not be disabled. But the other four interrupts are maskable interrupts, which can be disabled.

4) The TRAP has highest priority and the INTR has lowest priority among the hardware interrupts. The hardware interrupts in descending order of priority are listed below :
i) TRAP - highest priority ii) RST 7.5
iii) RST 6.5 iv) RST 5.5 v) I NTR - lowest priority.

Q. 23 What are software interrupts ? (March 2018)

OR Define 'software interrupts'. Mention call locations of all software interrupts. (Dec. 2020)

Ans. :

(1) The normal operation of a microprocessor can be interrupted by special instruction. Such an interrupt is called a **Software interrupt**.

(2) 8085 provides 8 user defined software interrupts RST 0 to RST 7 where RST means restart.

(3) These interrupts are vectored interrupts and when these interrupts are called the control is transferred to the memory location as shown below :

Interrupt	Mnemonics	Call Location (Hex)
RST	0	0000
RST	1	0008
RST	2	0010
RST	3	0018
RST	4	0020
RST	5	0028
RST	6	0030
RST	7	0038

(4) Software interrupts are not used to handle asynchronous events. They are used to call software routines like single step, break point etc.

(5) These interrupts are requested by executing interrupt instructions. They can also be requested due to arithmetic errors.

) After execution of these interrupts, program counter is incremented. The microprocessor does not execute any interrupt acknowledge cycle. The microprocessor executes normal instruction cycle.

) These interrupts cannot be ignored or masked. They have more priority than any hardware interrupt.

(8) They are not used to interface peripherals. That means they does not improve throughput of the system. They are used in program debugging.

Q. 24 Differentiate between hardware and software interrupts.

Ans. : 1) Hardware interrupts :

(i) Hardware interrupts are used to handle asynchronous events.

(ii) These interrupts are requested by external device.

(iii) After execution of these interrupts program counter is not incremented.

(iv) The microprocessor executes either interrupt acknowledge cycle or ideal machine cycle to acknowledge this interrupt.

(v) These interrupts may be non-maskable or maskable.

(vi) They have lower priority than any software interrupt.

(vii) These interrupt affect on interrupts control logic.

(viii) It improves throughput of the system.

2) Software interrupts :

(i) Software interrupts are not used to handle asynchronous events.

(ii) These interrupts are not requested by external device but by microprocessor itself.

(iii) After execution of these interrupts, program counter is incremented.

(iv) The microprocessor does not execute any interrupt acknowledge cycle. It executes normal instruction cycle.

(v) They cannot be masked or ignored.

(vi) Software interrupts has more priority than any hardware interrupt.

(vii) These interrupts does not affect on interrupt control logic.

(viii) They does not improve throughput of the system.

Q. 25 What are Hardware and Software interrupts ? List them with vector addresses.

(March 2009, Oct. 2006, 2007)

Ans : Please refer Q. No. 23 and Q. No. 24.

Q. 26 What are the Hardware interrupts ? Explain vectored and Non-vectored interrupts of 8085 MPU. (March 2015, 19)

Ans. :

Hardware interrupt are pin of Microprocessor . These are used to handle asynchronous events. These interrupts are requested by external device. After execution of these interrupts program counter is not incremented. These interrupt may be non-maskable or maskable. They have lower priority than any other software interrupt . It improves throughput of the system.

8085 provides 5 hardware interrupts. These are TRAP , RST 7.5, RST 6.5, RST 5.5 & INTR **Vectored Interrupt** - It means that when these interrupts are given, it is directed to transfer the control to specific memory location given by

TRAP - 0024 H , RST 7.5 - 003C H , RST 6.5 - 0034 H & RST 5.5 - 002C H

Among these interrupt TRAP is non-maskable interrupt which cannot be disabled while other four interrupts are maskable, which can be disabled.

Non- Vectored Interrupt - Interrupt which does not transfer to specific memory location is called Non Vectored Interrupt. INTR is non vectored interrupt because it is only request taken by other device & does not transfer control to any memory location . INTR has lowest Priority.

Q. 27 Differentiate between non-maskable and maskable interrupts.

OR Differentiate between maskable and nonmaskable interrupts of 8085 μP?

Ans. : 1) Non-maskable interrupts : (Oct. 2004, Oct. 2005, 21, July 2019, March 2020)

i) These interrupts can not be masked or cannot made pending.

ii) Non-maskable interrupt disables all maskable interrupts.

iii) It is used for emergency purpoes like power failure, smoke detector, parity check error etc.

iv) It has higher priority than maskable interrupts.

v) It is always vectored interrupt.

vi) Response time for non - maskable interrupt is low.

2) Maskable interrupts :

i) These interrupts can be masked or made pending.

ii) A maskable interrupt cannot disable any non-maskable interrupt.

iii) It is used to interface with peripheral devices.

iv) It has lower priority than non-maskable interrupts.

v) It may be vectored or non-vectored interrupt.

vi) Response time for maskable interrupts is high.

Q. 28 What are Vectored Interrupts ? What are Maskable and Non-maskable Interrupts ? State all Hardware Interrupts of 8085 Microprocessor with their priorities and branching or vector addresses. (March 2012, 19, 20)

Ans. :

1) **Vector Interrupt** : When interrupts are directed to transfer the control to specific memory location then it is called vectored interrupt.

Ex. - TRAP - 0024H, RST7.5 - 003CH

RST6.5 0034H, RST5.5 - 002CH

2) **Maskable Interrupt** : The interrupt which can be masked or made pending is known as maskable interrupt. It cannot disable by any non-maskable interrupt. It has lower priority than non-maskable interrupt. It may be vector or non Vectored interrupt.

Ex. - RST7.5, RST5.5, RST6.5 and INTR

(3) **Non - maskable Interrupt** : The interrupt which cannot be masked or do not made pending is known as Non-maskable interrupt. It can disable all maskable interrupt. It has higher priority than maskable interrupt. It is also always vectored interrupt.

Ex. - TRAP

(4) The TRAP has highest priority and INTR has lowest priority among the hardware interrupts. The Hardware interrupt with their priority and vector address are listed below:

Interrupt	Priority	Vector Address
TRAP	Highest Priority	0024 H
RST7.5	Lower than TRAP	003C H
RST6.5	Lower than RST7.5	0034 H
RST5.5	Lower than RST6.5	002C H
INTR	Lowest priority	-

Q. 29 Draw a labelled functional block diagram of microprocessor 8085.

(March 2008, 10 Oct. 99, 02; June 2016; March 2018; July 2018, Dec. 2020)

Ans. :

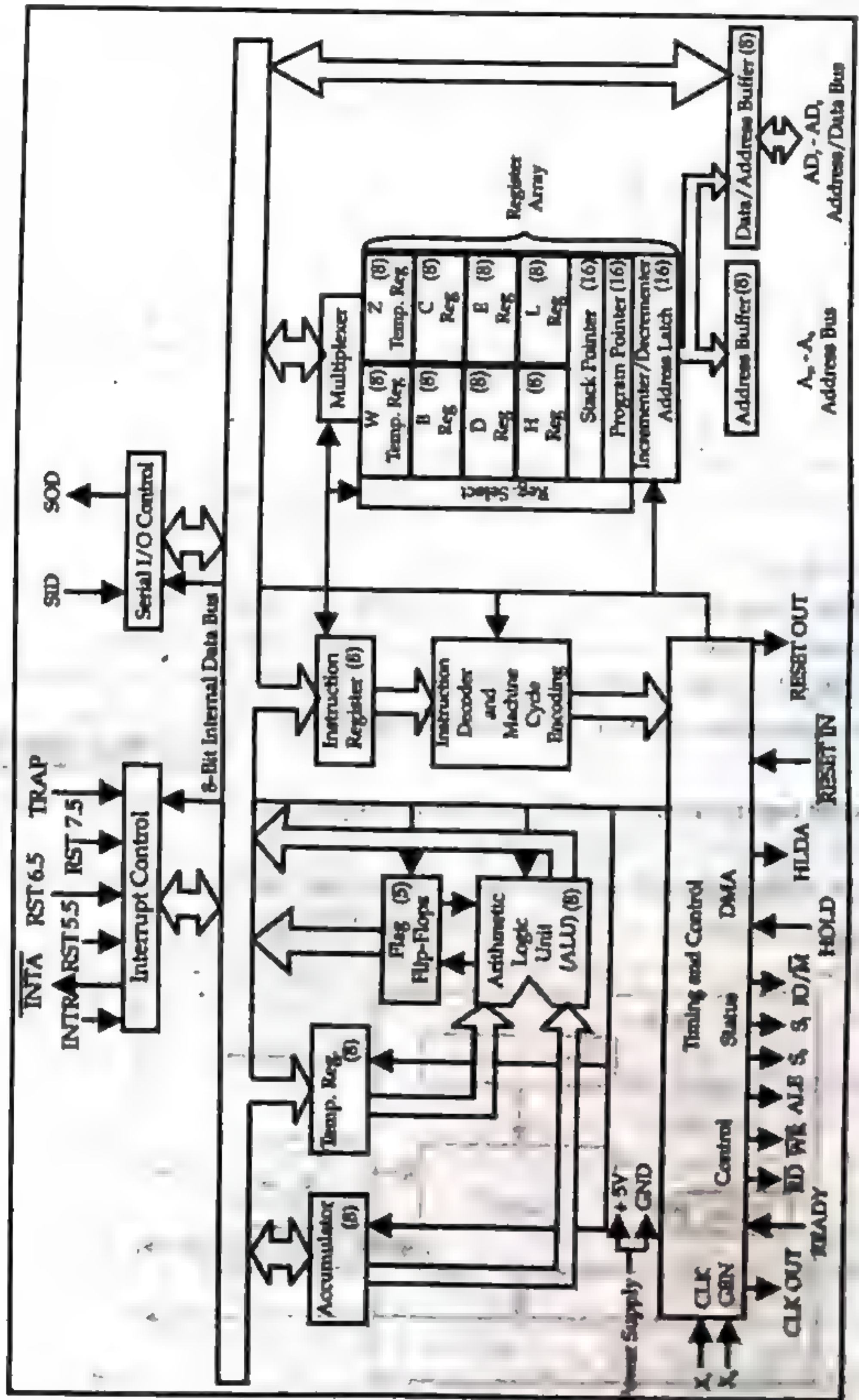


Fig. 1.6

Q. 30 Explain the function of ALU with simple block diagram. March 04, 06, 15; July 18

OR Draw a neat labelled diagram of generic ALU and explain its working. Oct. 06, 10; March 11, 18

Ans. : The organization of arithmetic and logic unit is shown in figure.

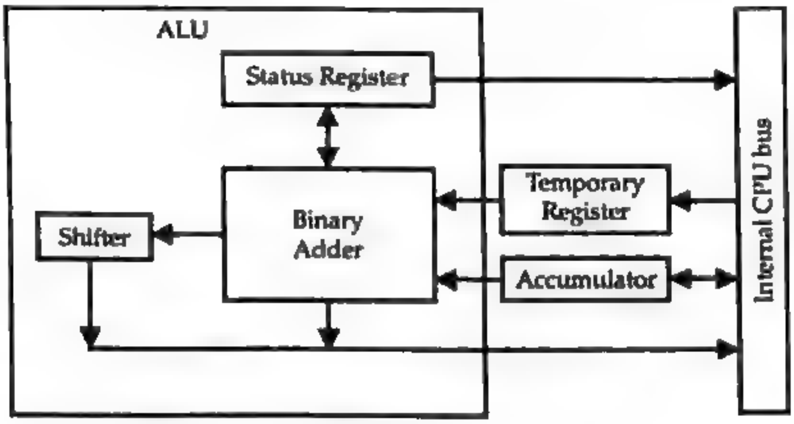


Fig. 1.7

1) The arithmetic and logic unit is 8-bit unit.
2) It performs arithmetic, logic and rotate operations.
3) It consists of binary adder to perform addition and subtraction by 2's complement method.
The result is typically stored in accumulator.
Accumulator, temporary register and flag register are closely associated with A. L.U.
The temporary register is used to hold data during an arithmetic/logic operation.
The flags are set or reset according to the result of operations in status register.

Q. 31 Explain organisation of ALU with the help of simple block diagram.
(March 2009, Oct. 2002, 08)

OR Explain the organization of ALU of 8085 microprocessor with the suitable diagram?
(Oct. 2021)

Ans. : 1) The arithmetic and logic unit performs operations such as add, shift/rotate, compare, increment, decrement, AND, OR, XOR, etc.

2) Fig. 1.8 shows some functional sections of ALU :

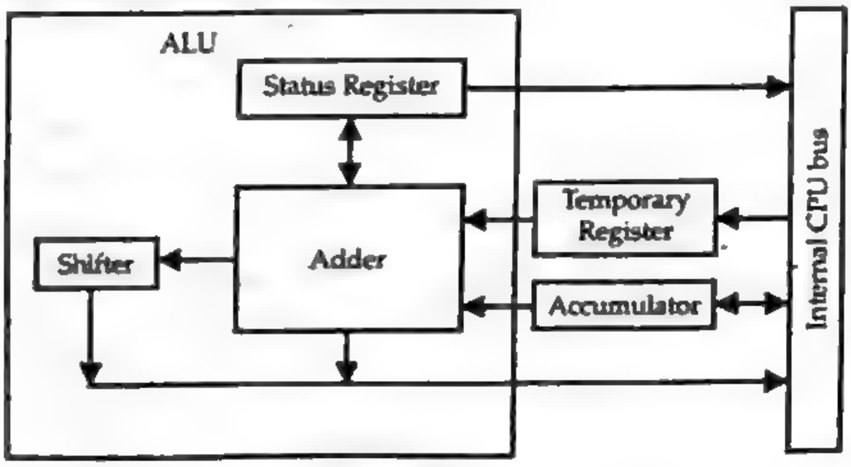


Fig. 1.8

3) The ALU contains : i) Adder ii) Shifter iii) Status register
4) Adder performs arithmetic operations like addition, subtraction, increment, decrement etc with the results being fed back into the accumulator via internal data bus.
5) Shifter performs logical operations like rotate left, rotate right etc. Result is again placed into the accumulator.

6) Status register or condition code register contains group of individual flip-flops that can be set or reset based on the conditions created by the last ALU operation.

7) The temporary and accumulator registers are many times considered to be part of ALU.

Q. 32 Draw the diagram of CPU registers of Intel 8085 with function of each register. Draw and explain programming model of 8085 MPU. (Oct. 2005, 09; July 2017)

OR Draw and label programming model of 8085 microprocessor. List the valid register pairs. (Dec. 2020)

Ans. : CPU registers of Intel 8085 are as follows :

Program status word (Flags) ←	PSW (8)	A (8)	→ Primary Accumulator
	B (8)	C (8)	Secondary
	D (8)	E (8)	Accumulator or
	H (8)	L (8)	Data counters
	SP (16)		→ Stack pointer
	PC (16)		→ Program counter

1) The 8085 MPU uses both 8-bit and 16-bit registers.
2) The 8085 has eight addressable 8-bit registers. Six of these can be used as 8-bit registers or 16- bit register pairs.
3) In addition, the 8085 contains two more 16-bit registers.
4) The 8085 registers are as follows : (March 2008)
   (1) **The accumulator (A register) :** It is the focus of all accumulator operations which include arithmetic, logic, load and store and I/O instructions. It is an 8-bit register.
   (2) **The general-purpose registers :** BC, DE and HL may be used as six 8-bit or as three 16-bit registers depending on the instruction being executed. The HL register pair (call a data pointer by Intel) can be used for address pointing. A few instructions use the BC and DE register pairs as address pointers, but normally they are used as general purpose data registers. (Oct 2010)
   (3) **The program counter (PC) :** It always points to the memory location of the next instruction to be executed. It always contains a 16-bit address.
   (4) **The stack pointer (SP) :** It is a special purpose address pointer (or data pointer) that always points to the top of the stack in RAM. It is a 16-bit register.
   (5) **The flag register :** It contains five 1-bit flags containing CPU status information. These flags are then used by conditional jump, call and return from subroutine instructions.

Q. 33 Define : (i) PSW (ii) MAR (iii) Stack Pointer. (March 2007)

Ans : (i) PSW: 1. PSW me Ans program status word.

2. PSW refers to the accumulator and the flag register; The accumulator is the high-order register and the flags are the low-order register.

3. Using stack operation like PUSH and POP, user can observe and modified the contents of flag register using instruction like PUSH PSW ————

(ii) MAR: Out of syllabus scope

(iii) Stack Pointer : **(Ch.1/Q-35(b)/P-1-23)**

Q. 34 Explain the function of following registers in 8085. (July 2018, 2019)

Ans. : I) Accumulator : (March 2000, 03, 04, 05, 06, 10, 20, Oct. 03, 09, 04, 08)

1) Accumulator is 8-bit main register in 8085, used to perform the arithmetical and logical operations. In such operations, one of the operand is always stored in accumulator.
2) It can be used as both primary source and destination register. The final result of operation is also stored in accumulator.
3) All data transfer between the CPU and I/O devices are performed through accumulator.
4) Many memory reference instructions move data between the accumulator and memory.

II) Temporary register : (March 2010, 22; July 2018)

1) The temporary register is used to store the data during execution of arithmetic or logic instructions.
2) This register is used internally and are not available to the programmer.

III) Incrementer/Decrementer : (Oct. 2002)

1) Incrementer/Decrementer is a 16-bit special purpose registers.
2) It is used to add or subtract one from the content of program counter or stack pointer.

IV) Register B (or C) :

1) Register B (or C) is a general purpose 8-bit register along with register C (or B).
2) It can also be used as a 16-bit register. The most significant 8-bits are stored in register B and the least significant 8-bits are stored in register C.
3) These are programmable means programmer can use them to load or transfer data.

V) Serial I/O control : (March 2005, 06, Oct. 2003, 08; July 18)

1) Most often I/O devices work with serial data in transmission.
2) The 8085 has two pins to implement serial transmission SID (Serial Input Data) and SOD (Serial Output Data).
3) The 8085 RIM instruction transfers data from SID to bit 7 of accumulator.
4) A single serial bit may be output via SOD pin of 8085, for this SIM instruction is used.

Q. 35 Explain the function of following units in microprocessor 8085 :

a) ALU **b) Stack pointer**
c) Instruction register and decoder **d) Program counter.**

(March 02, Oct. 07, 10; July 18, 19)

Ans. : a) ALU. : (Oct. 07; June 16)

1) Arithmetical and logical unit is 8-bit unit, where arithmetical and logical operations are carried out.
2) ALU contains binary adder to perform addition and subtraction by 2's complement method and other logical circuitry.
3) Data is supplied by accumulator, I/O device, memory etc.
4) The result is typically stored in accumulator.
5) According to the result of arithmetic logic operation, ALU either sets or resets flag.

b) Stack pointer (SP) : (March 2000, 03, 05,10, 11, 20, Oct. 02, 03, 05, 08,10)

1) Stack pointer is a 16-bit register, which contains the address of stack top. i.e. the memory address of last byte entered in stack.
2) With the help of incrementer/decrementer, the stack pointer is decremented each time data is pushed onto stack and incremented each time data is popped off the stack.

c) Instruction register and decoder :

(March 2000, 04, 05, 10, 11, 20 ; Oct. 2003, 04, 06, 07, 08, 09, 10)

1) During an instruction fetch, the first byte of the instruction i.e. the opcode is transferred to the 8-bit instruction register.
2) The contents of instruction register are, in turn available to the instruction decoder.
3) The output of decoder, gated by timing signals, controls the register, ALU and data/address buffers.
4) The output of decoder and internal clock generator produce the state and machine cycle timing signals.

d) Program counter (PC) : (March 2003, 04, 10, 11, 20 ; Oct. 2002, 04, 06, 09, 10)

1) The program counter is 16-bit register acting as a pointer to next executable instruction.
2) It always contains the 16-bit address of the memory location where next executable instruction is stored.
3) The microprocessor uses this register to sequence the execution of instruction.
4) The PC is autoincremented after a particular instruction has been fetched by the MPU.

Q. 36 Explain the following blocks of 8085 microprocessor : (March 2006)

(i) Serial I/O Control (ii) Accumulator

(iii) Multiplexed Address/Data Bus Buffer

Ans. : (i) Serial I/O Control : Please refer to Q. 34(v)

(ii) Accumulator : Please refer to Q. 34(I)

(iii) Multiplexed Address/Data Bus Buffer :

(i) This is an 8-bit bidirectional buffer.

(ii) It is used to drive multiplexed address /data bus i.e. low-order address bus ($A_7 - A_0$) and data bus ($D_7 - D_0$).

(iii) It is also used to tristate the multiplexed address/data bus under certain conditions such as reset, hold, halt and when the bus is not in use.

(iv) The address/data buffers are used to drive external address and data buses respectively. Due to these buffers the address and data buses can be tri-stated when they are not in use.

Q. 37 Describe in brief the functions of the following pins of 8085 Microprocessor :

(i) $IO/\overline{M}$ (ii) SID (iii) HLDA ([illegible])

Ans. : (i) Please refer Chapter 1, Q. 15(a), Pg. No. 1-11.

(ii) Please refer Chapter 1, Q. 13 Pg. No. 1-10

(iii) Please refer Chapter 1, Q. 11(4) Pg. No. 1-10

Q. 38 Explain function of the following Pins of 8085 MPU : (March 2014)

(i) HOLD (ii) SID

(iii) READY (iv) $\overline{WR}$

Ans. :

(i) Please refer chapter 1, Q. 10, Pg. No. 1-9.

(ii) Please refer Chapter 1, Q. 13 Pg. No. 1-10.

(iii) Please refer chapter 1, Q. 11, Pg. No. 1-10.

(iv) Please refer chapter 1, Q. 9, Pg. No. 1-9.

Q. 39 What are flags ? Enlist the different flags provided by 8085 microprocessor. Explain when they are set or reset. OR (Mar. 2010, Oct. 2004)

Define bit pattern of flag register and explain the significance of each flag bit. (March 2006, 09, 18, 22)

Ans. :

) A flag is a single bit status register (flip-flop).

) Flags are either set or reset by ALU according to the result by ALU.

3) Flags are important because they are the conditions for conditional branching instructions.

4) 8085 has five flags. Sign flag, Zero flag, Auxiliary carry flag, Parity flag and Carry flag. A 8-bit register is used to represent five flags as shown in following figure.

D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0	
S	Z	-	Ac	-	P	-	Cy	

(first row — Bit number; second row — Status flags)

where, S - Sign flag, Z - Zero flag, Ac - Auxiliary carry flag,

P - Parity flag, Cy - Carry flag.

(i) **Sign flag (S) :** After the execution of arithmetic and logic operation, if the most significant bit of the result is 1, then the sign flag is set to 1 otherwise 0.

This flag is used with signed number. If MSB is 1, the number will be negative and if it is 0, the number will be positive.

(ii) **Zero flag (Z) :** After performing an arithmetic or logic operation, if the result is zero, then zero flag is set to 1, else it is reset. This flag is modified by the results in accumulator as well as in other registers.

(iii) **Auxiliary carry flag (Ac) :** In an arithmetic operation, when carry is generated from bit D_3 to D_4, the auxiliary carry flag is set to 1. This flag is only available internally and used for B.C.D. operations and not available for programmer.

(iv) **Parity flag (P) :** Parity flag is set to 1, if the result stored in accumulator contains even parity i.e. even number of 1's. If accumulator contains odd number of 1's, the flag is 0.

(v) **Carry flag (Cy) :** This flag sets if carry produced by most significant bit during the execution of an arithmetic operation.

In subtraction carry flag serve as borrow flag.

Q. 40 Explain use of extended register pairs BC and HL of 8085 Microprocessor as Pointers with the help of suitable examples. **(March 2012)**

Ans. :

(1) **Use of pair BC as pointer :** BC pair can be used to point memory location for putting data at respective memory location or taken data to load to another, register.

Various instruction in 8085 used for pointing BC as a pointer are STAX B, LDAX B.

Ex. (1) STAX B let [B] = 40H, [C] = OOH and [A] = 55H. After execution of STAX B contents of accumulator = 55 H is transferred to memory location whose address is stored in BC i.e. 4000 H. Then after execution [4000] = 55 H.

(2) **Use of pair HL as pointer :** 8085 microprocessor uses HL pair to point memory location. The instruction used for pointing memory location by HL pair are listed below :

MOV r, M - move from memory

MOV M,.r - move to memory

MVI M, data - move immediate 8 bit data to memory

LXI H, 16 bit data - Load HL pair with address

LDAX H -Load accumulator Indirect

STAX H - Store accumulator Indirect

Example - MOV B, M

Let [HL] = 4000H, [4000] = 35H and [B] = 82H

After execution of MOV B, M, [B] = 35 H. It means that contents of memory address pointed by HL pair i.e. 35 H will loaded in B reg.

Q. 41 What is stack ? Give its related instructions in 8085. **(Oct. 2014)**

Ans. :

Stack is a part of R/W memory that is used for temporary storage of binary information during the execution of a program .

Stack related instructions are -

PUSH rp - Push register pair on stack

PUSH PSW - Push accumulator & flag register on stack

POP rp - Pop off stack to register pair

POP PSW - Pop off stack to Accumulator & Flag Register

Q. 42 Write a short note on flag register of 8085 microprocessor. Explain the significance of flag bits with one example. **(March, 2008, 2011, Oct. 2003, 2008, 2007)**

Ans. : Flag register : Please refer to Q. No. 39.

Significance of flag bits :

(1) Flags are examined in conditional instructions like JMP and CALL.

(2) After execution of arithmetic and logical instruction, according to result flags get affected.

For example : Let instruction : ADD B

Suppose [A] = CB H

[B] = E9 H

	[A]	= CB	=	1 1 0 0 1 0 1 1
+	[B]	= E9	=	1 1 1 0 1 0 0 1
		$\boxed{1}$		1 0 1 1 0 1 0 0

(i) Result is 9-bit. So overflow bit stored as a carry flag.

(ii) There is a carry from 3[rd] bit to 4[th] bit So Ac flag is set.

(iii) There 4 number of 1's so parity is set.

(iv) Result is non-zero so zero flag is reset.

(v) MSB of sum is 1 so sign flag is set.

Q. 43 Explain the sign and parity flags of 8085 microprocessor with suitable example. (March 2004)

Ans. :

1) In 8085, flags are either set or reset by ALU according to the result by ALU.

2) **Sign flag (S) :** After the execution of arithmetic and logic operation, if the most significant bit of the result is 1, then the sign flag is set to 1 otherwise 0.

This flag is used with signed number. If MSB is 1, the number will be negative and if it is 0 the number will be positive.

(3) **Parity flag (P) :** Parity flag is set to 1, if the result stored in accumulator contains even parity i.e. even number of 1's. If accumulator contains odd number of 1's, the flag is 0.

(4) Let : [A] = 37 H

[C] = 40 H

Instruction : SUB C

[C] :	40 H	= 0 1 0 0 0 0 0 0
2's complement		= 0 1 0 0 0 0 0 0
+ [A] : 37 H		= 0 0 1 1 0 1 1 1
	$\boxed{0}$	= 1 1 1 1 0 1 1 1
Complement carry ↓		
	$\boxed{1}$	1 1 1 1 0 1 1 1

Result : [A] = 1 1 1 1 0 1 1 1 = F7H

Result : [A] = 1 1 1 1 0 1 1 1 = F7H.

In the accumulator the D_7 bit is 1. This indicates that answer is negative so sign flag is set to 1. i.e. S = 1. The number of 1's in accumulator is 7 i.e. odd number so parity flag is reset i.e. P = 0.

Q. 44 The flag register of 8085 microprocessor contains the data 45 H. Interpret its meaning. (March 2002)

Ans. : Given that the flag register of 8085 contains data 45 H = 0100 0101.

We know that the 8085 has five flags and they are as follows :

Flag register :	S	Z	-	Ac	-	P	-	Cy
Given : 45 H :	0	1	0	0	0	1	0	1

1) Here, sign flag is reset, this means that result is unsigned (positive)
2) Zero flag is set, this means that result is equal to zero after the execution of arithmetic or logical operation.
3) Auxiliary carry flag is reset, this means that there is no auxiliary carry i.e. carry from bit D_3 to D_4 during arithmetic operation.
4) Parity flag is set means the result stored in accumulator contains even parity i.e. the result contains even number (0) of 1's.
5) Carry flag is set, this means there is a carry or borrow from most significant bit during the execution of arithmetic operation.

Q. 45 In 8085 microprocessor, the flag register content is 3C H. Interpret its meaning. (March 2004)

Ans. : Given that the flag register content is 3CH = 0 0 1 1 1 1 0 0.

Now, in 8085 flag register contains five flag as follows :

Flag register :	S	Z	–	Ac	–	P	–	Cy
Given : 3CH :	0	0	1	1	1	1	0	0

1) Here, sign flag is reset, this means that result is unsigned (positive)
2) Zero flag is also reset, this means that result is non-zero after the execution of arithmetic or logical operation.
3) Auxiliary carry flag is set, this means there is carry from bit D_3 to D_4 during arithmetic operation.
4) Parity flag is set means the result stored in accumulator contains even number of 1's.
5) Carry flag is reset means there is no carry or borrow from most significant bit during the execution of arithmetic operation.

All other positions in flag register are undefined.

Q. 46 The accumulator contain 05H, register B contain 08H, what will be contents of flags, on execution of ADD B instruction ? (Oct. 2014)

Ans. : A = 05 H = 00000101

B = 08 H = 00001000

After Execution of ADD B – 00000101

\+ 00001000

==========

00001101 = 0D H

B reg Contains 0D H

Flag register contents are as follows

S	Z	-	AC	-	P	-	CY
0	0	-	0	-	0	-	0

Sign flag reset because answer is positive

Zero flag is reset because result is non zero

Auxilary carry flag is reset because no carry is generated from bit D_3 to D_4

Parity flag is reset because in answer odd number of 1's present

Carry flag is reset because no carry is generated from MSB .

Q. 47 The flag register of 8085 microprocessor contains the data 95H Interpret its meaning. **(Oct. 2002)**

Ans. : Hint :

Flag register :	S	Z	–	Ac	–	P	–	Cy
95 H :	1	0	0	1	0	1	0	1

S = 1 = set = Means accumulator content is negative number.

Z = 0 = reset = Means accumulator content is not zero.

AC = 1 = set = Means there is carry from bit D_3 to D_4 during operation.

P = 1 = set = Means accumulator content is even number of 1's.

Cy = 1 = set = Means carry is generated in accumulator content

Q. 48 The flag register of 8085 micro-processor contains the data B5 H. Interpret its meaning. **(March 2005)**

Ans. :

Hint :

Flag reg	S	Z	–	AC		P	–	Cy
B5	1	0	1	1	0	1	0	1

S = 1 = set = Means accumulator content is negative number.

Z = 0 = reset = Means accumulator content is not zero.

AC = 1 = set = Means there is carry from bit D_3 to D_4 during operation.

P = 1 = set = Means accumulator content even number of 1's present.

Cy = 1 = set = Means there is a carry or borrow from most significant bit during the execution of airthmetic operation.

Q. 49 Explain any 3 flags available in 8085 if flag register contains CAH, interpret its meaning **(Oct. 2008)**

Ans:

Hint :

Flag Register : CAH

Flag :	S	Z	-	AC	-	P	-	CY
CAH :	1	1	0	0	1	0	1	0

S = 1 = set = Means accumulator content is negative number.

Z = 1 = set = Means accumulator content (i.e. result) is zero.

AC = 0 = reset = Means there is no carry generated from bit D_3 to D_4 during arithmetic operation.

P = 0 = reset = Means in accumulator content there is odd number of 1's present.

Cy = 0 = reset = Means there is a no carry or borrow from most significant bit during the execution of airthmetic operation.

Q. 50 Flag Register contains data 15 H, then interpretes its meaning. **(Oct. 2009)**

Ans:

Hint :

Flag Register :	S	Z	-	AC	-	P	-	CY
15 H :	0	0	0	1	0	1	0	1

S = 0 = reset = Means accumulator content is positive number.

Z = 0 = reset = Means accumulator content is (i.e. result) not zero.

AC = 1 = set = Means there is carry generated from bit D_3 to D_4 during arithmetic operation.

P = 1 = set = Means accumulator content even number of 1's present.

Cy = 1 = set = Means there is a carry or borrow from most significant bit during the execution of arithmetic operation.

Q. 51 The flag register of 8085 Microprocessor contains the data AAH, Interpret its meaning. **(March 2013)**

Ans. :

A A H = 1010 1010

8085 has five flag, their bit pattern is as follows

Flag Register	S	Z	–	AC	–	P	–	CY
Given AA H	1	0	1	0	1	0	1	0

(1) Here sign flag is set, this means number is negative

(2) Zero flag is reset, this means that after performing arithmetic or logical operation result is non zero.

(3) Auxiliary carry flag is reset, this means that three auxiliary carry i.e. carry from bit D_3 to D_4 during arithmetic operation.

(4) Parity flag is reset this means that result stored contains odd number of 1's.

(5) Carry flag is reset, this means that there is no carry or borrow from most significant bit during arithmetic operation.

Q. 52 The flag register of 8085 Microprocessor contains the data D9 H. Interpret it's meaning. [illegible]

OR Flag Register contains data D9H. Interpret its meaning. [illegible]

B reg Contains 0D H

Flag register contents are as follows

S	Z	-	AC	-	P	-	CY
0	0	-	0	-	0	-	0

Sign flag reset because answer is positive

Zero flag is reset because result is non zero

Auxilary carry flag is reset because no carry is generated from bit D_3 to D_4

Parity flag is reset because in answer odd number of 1's present

Carry flag is reset because no carry is generated from MSB .

Q. 47 The flag register of 8085 microprocessor contains the data 95H Interpret its meaning. **(Oct. 2002)**

Ans. : Hint :

Flag register :	S	Z	–	Ac	–	P	–	Cy
95 H :	1	0	0	1	0	1	0	1

S = 1 = set = Means accumulator content is negative number.

Z = 0 = reset = Means accumulator content is not zero.

AC = 1 = set = Means there is carry from bit D_3 to D_4 during operation.

P = 1 = set = Means accumulator content is even number of 1's.

Cy = 1 = set = Means carry is generated in accumulator content

Q. 48 The flag register of 8085 micro-processor contains the data B5 H. Interpret its meaning. **(March 2005)**

Ans. :

Hint :

Flag reg	S	Z	–	AC		P	–	Cy
B5	1	0	1	1	0	1	0	1

S = 1 = set = Means accumulator content is negative number.

Z = 0 = reset = Means accumulator content is not zero.

AC = 1 = set = Means there is carry from bit D_3 to D_4 during operation.

P = 1 = set = Means accumulator content even number of 1's present.

Cy = 1 = set = Means there is a carry or borrow from most significant bit during the execution of airthmetic operation.

Q. 49 Explain any 3 flags available in 8085 if flag register contains CAH, interpret its meaning **(Oct. 2008)**

Ans:

Hint :

Flag Register : CAH

Flag :	S	Z	-	AC	-	P	-	CY
CAH :	1	1	0	0	1	0	1	0

S = 1 = set = Means accumulator content is negative number.

Z = 1 = set = Means accumulator content (i.e. result) is zero.

AC = 0 = reset = Means there is no carry generated from bit D_3 to D_4 during arithmetic operation.

P = 0 = reset = Means in accumulator content there is odd number of 1's present.

Cy = 0 = reset = Means there is a no carry or borrow from most significant bit during the execution of airthmetic operation.

Q. 50 Flag Register contains data 15 H, then interpretes its meaning. (Oct. 2009)

Ans:

Hint :

Flag Register :	S	Z	-	AC	-	P	-	CY
15 H :	0	0	0	1	0	1	0	1

S = 0 = reset = Means accumulator content is positive number.

Z = 0 = reset = Means accumulator content is (i.e. result) not zero.

AC = 1 = set = Means there is carry generated from bit D_3 to D_4 during arithmetic operation.

P = 1 = set = Means accumulator content even number of 1's present.

Cy = 1 = set = Means there is a carry or borrow from most significant bit during the execution of arithmetic operation.

Q. 51 The flag register of 8085 Microprocessor contains the data AAH, Interpret its meaning. (March 2013)

Ans. :

A A H = 1010 1010

8085 has five flag, their bit pattern is as follows

Flag Register	S	Z	–	AC	–	P	–	CY
Given AA H	1	0	1	0	1	0	1	0

(1) Here sign flag is set, this means number is negative

(2) Zero flag is reset, this means that after performing arithmetic or logical operation result is non zero.

(3) Auxiliary carry flag is reset, this means that three auxiliary carry i.e. carry from bit D_3 to D_4 during arithmetic operation.

(4) Parity flag is reset this means that result stored contains odd number of I's.

(5) Carry flag is reset, this means that there is no carry or borrow from most significant bit during arithmetic operation.

Q. 52 The flag register of 8085 Microprocessor contains the data D9 H, Interpret it's meaning. [illegible]

OR Flag Register contains data D9H. Interpret its meaning. [illegible]

Ans. :

D9 H = 1101 1001

8085 have five flag their bit pattern is as follows :

Flag register	S	Z	–	AC	–	P	–	CY
Given D9H	1	1	0	1	1	0	0	1

1. Here sign flag is set, this means number is negative.
2. Zero flag is set, this means that result is zero, after the execution of arithmetic or logical operation.
3. Auxiliary carry flag is set, this means there is a carry from bit D_3 to D_4 during arithmetic operation.
4. Parity flag is reset, this means that result stored contains odd number of 1's.
5. Carry flag is set, this means there is a carry or borrow from most significant bit during the execution of arithmetic operation.

Q. 53 Flag register contains data D5H. Interprete its meaning. **(July 2017)**

Ans. :

D5 = 11010101

1	1	0	1	0	1	0	1

S = 1 = set = Accumulator content is negative

Z = 1 = set = Accumulator content means result is zero.

AC = 1 = set = In accumulator content carry is generated from D_3 to D_4 in airmetic operation.

P = 1 = set = means accumulator contain even no. of 1's.

Cy = 1 = set = means there is carry or borrow generated from most significant bit during execution of operation

Q. 54 What is program counter ? Explain its working.

Ans. :

1) Program counter is a special purpose 16-bit register. It contains the address of memory location where next instruction to be executed is stored.

2) The microprocessor uses this register to sequence the execution of instructions.

3) When an instruction is executed, the instruction register takes next instruction from the memory location, whose address is stored in program counter.

4) When the instruction is being fetched the program counter is incremented to point the memory location of next instruction.

5) In case of subroutine, when a subroutine is called then the contents of program counter, which is the address of the instruction following the CALL instruction is stored in stack and address of stack top is stored in stack pointer. After executing subroutine, by using stack pointer, program counter takes its initial contents from stack and program is executed in normal sequence.

Q. 55 Define the following terms with suitable diagram : (March 02, 05, 10, 11, 17, 18, 19; Oct. 04, 06; July 18)

(a) Instruction cycle, (b) Machine cycle (c) T-state

Ans. :

a) **Instruction cycle :** An instruction cycle is defined as the time required to complete the execution of an instruction. The 8085 instruction cycle consists of one to five machine cycle.

b) **Machine cycle :** Machine cycle is defined as the time required to complete any operation of accessing either memory or I/O which is the subpart of an instruction. In 8085, the machine cycle may consist of three to six T-states.

c) **T-state :** The subdivision of an operation, which is performed in one clock period is called as T-state. Diagrammatic representation is as follows :

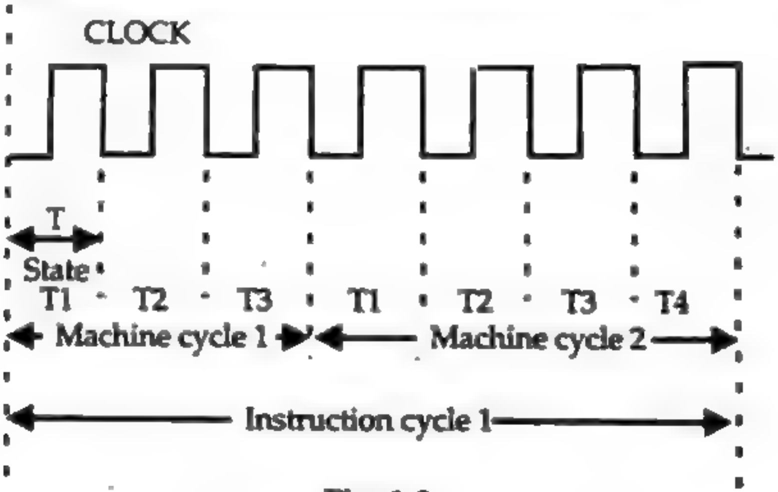


Fig. 1.9

Fig 1.9 shows machine cycles, T-states and instruction cycle required for execution of an instruction. From it is clear that an instruction cycle consists of number of machine cycles and a machine cycle consists of number of T-states.

Q. 56 Explain the following : FETCH Cycle. (March 2015)

Ans. :

FETCH Cycle

To load an instruction or piece of data from memory into a CPU's register. All instructions must be fetched before they can be executed. The time it takes to fetch an item is known as the *fetch time* or *fetch cycle*, and is measured in clock ticks.

Q. 57 Select the correct alternative and rewrite the following.

1. Microprocessor 8085 is manufactured by ——

   (i) Motorola (ii) Toshiba (iii) Intel (iv) Z ilog

Ans. : (iii) Intel

2. 8085 uses —— V power supply

   (i) + 5 (ii) – 5 (iii) +12 (iv) – 12

Ans. : (i) +5

3. There are —— flags in 8085.
(i) 8 (ii) 2 (iii) 3 (iv) 5

Ans. : (iv) 5

4. The register in the CPU that keeps track of the address of the next instruction to be fetched from program memory is called the ——
(i) Program counter (ii) Instruction register
(iii) Accumulator (iv) Stack pointer

Ans. : (i) Program counter

5. Intel 4004 is —— bit microprocessor.
(i) 4 (ii) 44 (iii) 8 (iv) 16

Ans. : (i) 4

6. In the flag register of 8085 microprocessor ——— number of bits are kept unused. (Oct. 2003)
(i) 5 (ii) 3 (iii) 4 (iv) 2

Ans. : (ii) 3

. The invalid register pair for 8085 microprocessor is —— (March 2002, March 2005)
(i) BC (ii) HL (iii) SP (iv) DE

ns. : (iii) SP

. The crystal frequency of 8085 is —— and operating frequency is —
(i) 6 MHz, 5 MHz (ii) 3 MHz, 6 MHz
(iii) 6 MHz, 3 MHz (iv) 5 MHz, 5 MHz

Ans. : (iii) 6 MHz, 3 MHz

9. After execution of an arithmetic instruction, the flag register of 8085 contains 04 H. This means that the result is ——
(i) Positive (ii) Negative (iii) Floating (iv) none of these

Ans. : (i) Positive

10. CPU generally contains storage device called ——— (Oct. 2002)
(i) Registers (ii) ALU
(iii) Timing and control (iv) Counter

Ans. : (i) Registers

11. ——— is not a vectored interrupt. (Oct. 2004)
(i) Trap (ii) INTR (iii) RST 7.5 (iv) RST 6.5

Ans. : (ii) INTR

12. In 8085 microprocessor, serial data from external device is received on ——— pin.
(i) SID (ii) SOD (iii) HOLD (iv) READY (March 2004)

Ans. : (i) SID

13. ——— flag bit is reset, when flag resister content is D4H. (March 2006)
(i) S (ii) Z (iii) CY (iv) AC

Ans. : (iii) CY

14 ——— register of 8085 is only used during arithmetical and logical operations and not for any other purpose.
(i) ACC (ii) B (iii) TEMP (iv) SP

Ans. : (iii) TEMP

15. In the flag register of 8085 microprocessor _______ number of bits are kept unused. (Oct. 2003)

(i) 5 (ii) 3 (iii) 4 (iv) 2

Ans. : (ii) 3

16. In 8085 microprocessor, serial data from external device is received on ____ pin. (March 2004)

(a) SID (b) SOD (c) HOLD (d) READY

Ans. : (a) SID

17 _______ is not a vectored interrupt. (Oct. 2004)

(i) Trap (ii) INTR (iii) RST 7.5 (iv) RST 6.5

Ans. : (ii) INTR

18. Usually operating frequency of 8085 is _______ (Oct. 2004)

(i) 3 MHz (ii) 100 MHz (iii) 1 MHz (iv) 20 MHz

Ans. : (i) 3 MHz

19. The invalid register pair for 8085 micro-processor is ________ (March 2005)

(i) BC (ii) HL (iii) SP (iv) DE

Ans. : (iii) SP

20. _____ flag bit is reset, when flag resister content is D4H. (March 2006)

(i) S (ii) Z (iii) CY (iv) AC

Ans. : (iii) CY

21. _______ register of 8085 is only used during arithmetical and logical operations and not for any other purpose. (i) ACC (ii) B (iii) TEMP (iv) SP (Oct. 2006)

Ans. : (iii) TEMP

22. __________ is a 32 bit microprocessor. (Oct. 2007)

i) 8086 ii) 80386 iii) Intel Pentium iv) M68000

Ans. : (ii) 80386

23. ________ bus is one way data path from MPU to all devices. (March 2008)

(i) Data (ii) Address (iii) Control (iv) None of these

Ans : **Address**

24 TRAP is a non-maskable interrupt with ______ priority. (Oct. 2008)

(i) highest (ii) lowest
(iii) intermediate (iv) no

Ans : (i) highest

25. In case of 8085 microprocessor, data bus between ALU and accumulator is ______. (March 2009)

(i) Bidirectional (ii) Unidirectional
(iii) Either Unidirectional or Bidirectional
(iv) Neither Unidirectional nor Bidirectional

Ans. (i) Bidirectional

26. _____ is Non-maskable Interrupt. (March 2010)

(i) TRAP (ii) RST 7.5 (iii) RST 6.5 (iv) RST 5.5

Ans. : (i) TRAP

27. Micro-processor 8085 belongs to ______ Company. (March 2010)

(i) Motorla (ii) Zilog (iii) Intel (iv) Toshiba

Ans. : (iii) Intel

28. In 8085 Microprocessor, serial data is outputted to the external device through_____ pin. (Oct. 2010)

(i) SID (ii) SOD (iii) S_0 (iv) S_1

Ans : (iii) S_0

29. In 8085 Microprocessor, _________ pin is the only output terminal interrupt control block. (March 2012)

(i) TRAP (ii) IN IR

(iii) RST 7.5 (iv) $\overline{\text{INTA}}$

Ans.: (iv) $\overline{\text{INTA}}$

30. ________ pin of Micro-processor 8085 is never tr. Stated. (Oct. 2012)

(i) SOD (ii) READY

(iii) ALE (iv) HOLD

Ans. : (iii) ALE

31. ALU is ______ bit unit in 8085 Microprocessor. (March 2013)

(i) 8 (ii) 16 (iii) 32 (iv) 64

Ans. : (i) 8

32. Micro-processor T 8190 is a ________ bit Micro-processor. (Oct. 2013)

(i) 4 (ii) 8 (iii) 12 (iv) 16

Ans. : (iii) 12

33. ___________pin of 8085 MPU is multiplexed. (March 2014)

(i) IO/ $\overline{\text{M}}$ (ii) HOLD (iii) SID (iv) ALE

Ans. : (i) IO/ $\overline{\text{M}}$

34. There are _______ flags in Micro-processor 8085. (Oct. 2014)

(i) 8 (ii) 6 (iii) 5 (iv) 16

Ans. : (iii) 5

35. Micro-processor 8085 has _______ bit wide data bus. (Oct. 2014)

(i) 8 (ii) 16 (iii) 32 (iv) 64

Ans. : (i) 8

36. ___________ is used to store 8 bit opcode is 8085. (March 2015)

(i) IR (ii) PC (iii) SP (iv) Accumulator

Ans. : (i) IR

37. In 8085 Microprocessor ______ Pin in used for demultiplexing of address/data bus. (Oct. 2015)

(i) S_0 (ii) ALE (iii) $IO/\overline{M}$ (iv) HOLD

Ans. : (ii) ALE

38. When RST 7.5 vector interrupt is activated in 8085 microprocessor the control is transfered to ______. (July 2016)

(i) 0024 H (ii) 002C H (iii) 0034 H (iv) 003C H

Ans. : (iv) 003C H

39. The flag register of 8085 microprocessor contains ______ flags. (March 2017)

(i) 8 (ii) 3 (iii) 7 (iv) 5

Ans. : (iv) 5

40. In CPU, the register which keeps the track of address of next instruction to be fetched is called ______. (July 2017)

(i) Instruction Register (ii) Program Counter
(iii) Stack Pointer (iv) Accumulator

Ans. : (ii) Program Counter

41. Intel 8085 is a/an ______ bit Microprocessor. (March 2018)

(i) 16 (ii) 4 (iii) 8 (iv) 32

Ans. : (iii) 8

42. Stack pointer of 8085 holds ______. (March 2018)

(i) 8 bit address (ii) 16 bit data
(iii) 16 bit address (iv) 8 bit data

Ans. : (iii) 16 bit address

43. Microprocessor 8085 is manufactured by ______. (July 2018)

(i) Intel (ii) Motorola (iii) Zilog (iv) Toshiba

Ans. : (i) Intel

44. ______ bits of flag register of 8085 Microprocessor are unused. (March 2019)

(i) 1 (ii) 2 (iii) 3 (iv) 4

Ans. : (iii) 3

45. The register in 8085 Microprocessor that keeps the track of the address of next executable instruction is ______. (July 2019)

(i) Program Counter (ii) Stack Pointer
(iii) Program Status Word (iv) Instruction Register

Ans. : (i) Program Counter

46. ______ is non-maskable interrupt in 8085. (March 2020)

(i) RST 5.5 (ii) RST 6.5 (iii) RST 7.5 (iv) TRAP

Ans. : (iv) TRAP

□□□

Chapter 2

Instruction Set and Programming of 8085

Probable marks : 43

Scope of the syllabus :-

- Addressing modes in 8085
- Programming model of 8085
- Instruction Set and
- Programming of 8085
- Study of instruction set :
- Data transfer, Arithmetic, Logic, Branching, Stack, I/O and machine control instructions.
- Assembly language programming based on instructions.

Q. 1 What do you mean by addressing modes of a microprocessor ? Enlist the addressing modes in 8085.

Ans. :

(1) Addressing mode of a microprocessor is the various formats of specifying one operands (directly, indirectly etc). The operand can be data (8 or 16 bit), address, register or it can be implicit.

(2) Every microprocessor has its own set of instructions. Each of these instructions uses one of the addressing modes.

(3) The microprocessor 8085 has five addressing modes, which are given below :

i) Direct addressing

ii) Register addressing

iii) Immediate addressing

iv) Register indirect addressing

v) Implied addressing

Q. 2 Explain any two addressing modes in 8085. OR
Explain all addressing modes in 8085. OR
Explain direct and implicit addressing modes of 8085 microprocessor. OR

(March 02, 15

What are different addressing modes used in 8085 microprocessor ? Explain any two of them with a suitable example. Mar.02, 04, 05, 09, 2011 Oct. 2009, 2010; July 17

Ans. : (I) Direct addressing mode : **(July 2017, March 2018, 22)**

(1) In direct addressing, the address appears after opcode of instruction in program memory.

(2) The address of operand is specified within the instruction.

(3) The instructions using direct addressing mode are three byte instructions. Byte 1 is opcode of instruction, Byte 2 is lower order address and Byte 3 is high order address.

(4) For e.g. LDA 9FFFH

i.e. This instruction loads accumulator with content of memory location 9FFF H.

(II) Register addressing mode : **(March 2004)**

(1) In register addressing mode, the source operands are general purpose registers whose name is specified within the instruction.

(2) These instructions are single byte instructions.

(3) All actions occur within the CPU.

(4) For e.g. MOV A, B.

i.e. This instruction transfers the content of register B to accumulator without modifying the content of B.

(III) Immediate addressing mode : **(March 2018, 22, July 2019)**

(1) In immediate addressing the data appears immediately after opcode of instruction in program memory.

(2) In these instructions the actual data is specified within the instruction.

(3) These operations are specified with either 2 or 3 byte instructions.

(4) For e.g. ADI 05H

i.e. this instruction adds immediate data 05 H to the content of accumulator. The result is stored in accumulator.

(IV) Register indirect addressing mode : **(Oct. 2005, 09, 21; July 2017, March 2022)**

(1) In register indirect addressing the content of register pair points to the address of the operand.

(2) A register pair (H-L pair) is specified for addressing 16-bit address of memory location.

(3) These are generally 1-byte instruction.

(4) For e.g. ADD M

i.e. this instruction will add the content of memory location whose address is stored in H-L pair to the content of accumulator.

(V) Implicit addressing mode : **(Oct. 2005, 21)**

(1) In this type of instructions, generally operand is not specified within the instruction and it is predetermined.

(2) Generally the operand is accumulator.

(3) Most of the logical group instructions belong to this addressing mode.

(4) These are single byte instructions.

(5) All actions occur within the CPU.

(6) For e.g. CMA

i.e. this instruction will complement the content of accumulator. Here, the actual operand is not specified in the instruction, but is predetermined (accumulator). The result is stored in accumulator.

Q. 3 Explain register indirect and immediate addressing modes in case of 8085 microprocessor with the help of suitable examples.

(Oct. 03,07,08; June 16; July 17, March 2020)

Ans. : I) Register indirect addressing mode :

1) Register indirect instructions reference memory using the contents of a register pair to point the address of the operand.

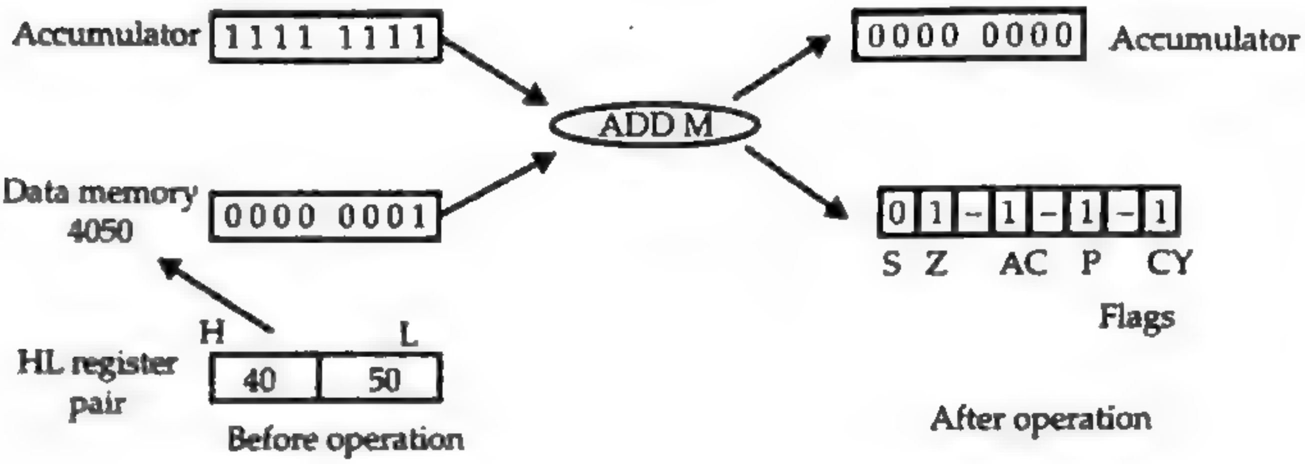
2) A register pair (H-L pair) is specified for addressing 16-bit address of memory location.

3) These are generally 1 byte instructions.

4) For example :

ADD M (add memory)

This instruction adds the contents of the accumulator to the contents of memory pointed to by the address in the HL register pair.



In the given example, the HL register pair points to memory location 4050 H. The data in this location $(0000\ 0001)_2$ is then added to the contents of the accumulator $(1111\ 1111)_2$.

The sum is stored in accumulator and appropriate flags are also set and reset based on the result.

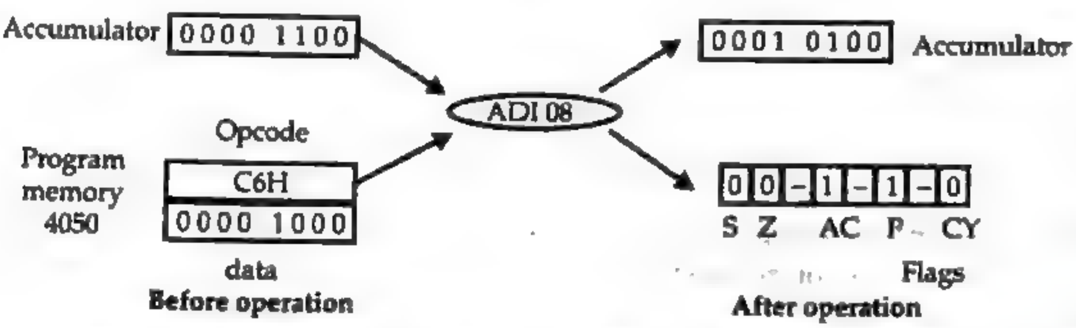
II) Immediate addressing mode : (March 2009)

1) In immediate addressing the data appears immediately after opcode of instruction in program memory.

2) These are generally 2 or 3 byte instructions.

3) **For example**

ADI 08 H



In the example, MPU fetches the opcode (C6) from program memory and after decoding it. MPU finds the immediate data $(0000\ 1000)_2$ in the next consecutive program memory location. This data is added to the contents of the accumulator and result is placed in the accumulator.

Q. 4 What do you understand by register indirect and implicit addressing modes ? Explain with suitable example. List the names of any four instructions which make accumulator content clear. **(Oct. 2005)**

Ans. : Register indirect addressing : Please refer to Q. 3 (I).

Implicit addressing : Please refer to Q. 3 (II).

Following four instructions make accumulator content clear :

(1) ANI 00H (2) XRA A (3) SUB A (4) MVI A, 00H

Q. 5 What are the different ways of clearing Accumulator (A = 00H) in single instruction ? **(March 2011, 2017)**

Ans : (i) MVI A, 00H (ii) SUB A
(iii) XRA A (iv) ANI 00H

Q. 6 What are the groups in which instructions in 8085 are classified? **(Oct.1998)**

Ans. : The instructions in 8085 can be classified into following five groups, depending upon their function :

1) Data transfer group
2) Arithmetic group
3) Logical group
4) Branching group
5) Machine control group

1) **Data Transfer Group :**

This group of instruction copies data from a location called source to another location called a destination without modifying the content of source. These instructions move data between registers or between memory locations and registers. For eg. MOV, MVI etc.

2) **Arithmetic Group :**

The instruction of this group performs arithmetic operations such as addition, subtraction, increment or decrement etc. on data in registers or memory. For eg. ADD, SUB, INR, DCR etc.

3) **Logical Group :**

The logical group instructions perform logical operations such as AND, OR, XOR, complement etc. generally with the accumulator.

4) **Branching Group :**

The branching group instructions allow programmer to change the sequence of execution of program either conditionally or unconditionally.

For e.g. JMP, JC, JZ etc.

5) **Machine Control Group :**

These instructions control machine operations such as Halt, Interrupt

For e.g. NOP, HLT.

Q. 7 How instructions of 8085 are grouped according to its length ?

Ans. : Instructions of microprocessor 8085 are grouped into three groups according to its length as follows :-

(i) One byte instructions (One word)

(ii) Two byte instructions (Two word)

(iii) Three byte instructions (Three word)

(i) **One byte instructions :**

These instructions are having opcode and operand both in one byte. These require only one byte to store in memory.

OPCODE & OPERAND	1 Byte

e.g. MOV A B, ADD B etc.

(ii) **Two byte instructions :**

These instructions require two bytes to store in memory. First byte gives opcode and second byte gives operand, which is generally 8-bit immediate data.

OPCODE	First Byte
Data/Address	Second Byte

e.g. SUI 35 H, ADI FF H etc.

(iii) **Three byte instructions :**

These instructions require three bytes to store in memory. First byte gives opcode and second and third byte gives 16-bit address of memory location or 16-bit immediate data. Note that second byte gives lower order address/data byte and third byte gives higher order address/ data byte.

OPCODE	First Byte
Low order 8-bit of address/data	Second byte
High order 8-bit of address/data	Third byte

e.g. LDA 8AFF H.

LXI H, FFE3 H

Q. 8 Explain the following instructions of 8085 microprocessor with suitable example.

(a) SPHL (b) PCHL (Mar. 02, 2010, 03, Oct. 08, 10)

Ans. : (a) SPHL : [Copy H and L register to SP]

Format	:	$[SP_L] \leftarrow [L]$
		$[SP_H] \leftarrow [H]$
Addressing	:	Register addressing
Group	:	Machine control group [stack operation]
Bytes	:	1 byte
Flag	:	None

Comment : This instruction copies the content of register L into lower order byte of stack pointer and the content of register H into higher order byte stack pointer. The content of registers H and L are not affected. This instruction is used for initializing the stack pointer.

Example : Let, [H] = 25 H and [L] = 59 H
Instruction : SPHL
After execution : [SP] = 2559 H

(b) **PCHL :** (June 2016)

[LOAD PROGRAM COUNTER WITH HL REGISTER PAIR CONTENT]

Format	:	$[PC_H] \leftarrow [H]$
		$[PC_L] \leftarrow [L]$
Addressing	:	Register addressing
Group	:	Branching group
Bytes	:	1 byte
Flag	:	None

Comment : This instruction moves the content of register H to higher order byte of program counter and the content of register L to lower order byte of program counter. This instruction is equivalent to one byte unconditional jump instruction, with jump address stored in H-L pair.

Example : Let, [H] = 25 H and [L] = 39 H
Instruction : PCHL
After execution : [PC] = 2539 H

After execution of PCHL instruction, the control will be transferred to memory location 2539 H.

Q. 9 Explain PCHL Instruction of micro-processor 8085 and justify the statement that it is equivalent to 3 byte unconditional jump instruction. (Oct. 2012)

Ans. : For only Explanation of PHCL Please refer Q. 8(b), Pg. No. 2-6.

In PCHL program counter is loaded with memory address stored in HL pair. In JMP address program counter is loaded with memory address specified in instruction. Working of both instruction is same i.e. load PC with memory address hence PCHL is equivalent to unconditional jump.

Q. 10 What are branching instructions ? Explain the jumping instructions with jump conditions. (March 2006, Oct. 2009; July 18)

OR What are branching instruction? Enlist any four conditional branch instructions of 8085 microprocessor? (Oct. 2021)

Ans. :

(1) The instructions which allow user to change the control of flow of program execution are called the branching instructions.

(2) There are two types of branch instructions - unconditional and conditional. In unconditional transfer, no condition is tested. In conditional transfer the status of one of the flag is tested to determine whether the branch is to be executed or not.

Two types of jump instructions are as follows :

(3) Unconditional jump :

Instruction	:	JMP addr
Format	:	[PC] ← addr
Addressing	:	Immediate addressing
Group	:	Branching group
Bytes	:	3 bytes
Flag	:	None

Comment : The control is transferred unconditionally to the memory location, whose address is specified in the instruction.

(4) Conditional jump :

In conditional jump instructions , the jump is taken only if the condition is true. The conditional jump instructions and conditions are as given below.

i)	JNZ addr	:	Jump on not zero (Z = 0)
ii)	JZ addr	:	Jump on zero (Z = 1)
iii)	JNC addr	:	Jump on not carry (Cy = 0)
iv)	JC addr	:	Jump on carry (Cy = 1)
v)	JPO addr	:	Jump on odd parity (P = 0)
vi)	JPE addr	:	Jump on even parity (P = 1)
vii)	JP addr	:	Jump on plus (S = 0)
viii)	JM addr	:	Jump on minus (S = 1)

If the condition is satisfied, then only the address of memory location specified in the instruction is loaded in program counter.

Q. 11 How a subroutine can be called conditionally and unconditionally ? OR

Explain CALL instruction of 8085 microprocessor. OR

In case of 8085 microprocessor, explain unconditional and conditional call instructions with suitable example. (Mar.09,Oct 2010; March 2018; July 18)

Ans. :

(1) A subroutine is a short set of program instructions written separately from the main program to perform a function that occurs repeatedly in the main program.

(2) A subroutine can be called by two ways :

(a) **Unconditional call :**

Instruction : CALL addr

Format : $[[SP] - 1] \leftarrow [PC_H]$

$[[SP] - 2] \leftarrow [PC_L]$

$[SP] \leftarrow [SP] - 2$

$[PC] \leftarrow addr$

Addressing : Immediate addressing

Group : Branching group

Bytes : 3 bytes

Comment : CALL instruction is used to call a subroutine unconditionally. Before the control is transferred to the subroutine, the address of next instruction to be executed of the main program is stored in the stack. The content of SP are decremented by 2. Then, the program jumps to the subroutine whose starting address is specified in the instruction.

(b) **Conditional Call :**

In conditional call, the subroutine is called only if the condition is satisfied. In conditional call, following procedure is followed, if the condition is true.

Format : $[[SP] - 1] \leftarrow [PC_H]$

$[[SP] - 2] \leftarrow [PC_L]$

$[SP] \leftarrow [SP] - 2$

$[PC] \leftarrow addr$

The conditional call instructions and conditions are as listed below :

i) CC addr : Call if carry (Cy = 1)
ii) CNC addr : Call if no carry (Cy = 0)
iii) CZ addr : Call if zero (Z = 1)
iv) CNZ addr : Call if no zero (Z = 0)
v) CP addr : Call if plus (S = 0)
vi) CM addr : Call if minus (S = 1)
vii) CPO addr : Call if odd parity (P = 0)
viii) CPE addr : Call if even parity (P = 1)

Q. 12 Explain return procedure in RET instruction.

Ans. :

(1) The RET instructions are used to return from subroutine to main program.

(2) The return instruction is written at the end of the subroutine indicating end of subroutine.

(3) Instruction : RET

Format : $[PC_L] \leftarrow [[SP]]$, $[PC_H] \leftarrow [\,[SP] + 1]$

$[SP] \leftarrow [SP] + 2$

Addressing : Register indirect

Group : Branching group

Bytes : 1 byte

Comment : The content of memory location, whose address is specified in stack pointer are moved to the lower order byte of program counter. The content of the memory location whose address is one more than the content of SP moved to the higher order byte of program counter. The contents of stack pointer are incremented by 2.

(4) On completing the execution of subroutine the RET instruction is executed which loads back the stack contents i.e. addresses of the instruction following CALL instruction, in program counter. Thus the control returns into main program.

Q. 13 Explain the use of stack and stack pointer register in Intel 8085. **(Oct. 05)**

Ans. :

1) The stack is a part of Read/Write memory that is used for temporary storage of binary information during the execution of a program.
2) The binary information is basically the immediate results and the return address in case of subroutine programs.
3) The stack is shared by the programmer and the microprocessor.
4) The programmer can store and retrieve the contents of a register pair by using PUSH and POP instructions.
5) Similarly, the microprocessor automatically stores the contents of the program counter when subroutine is called.
6) The stack is implemented with the help of special memory pointer register called the stack pointer.
7) During PUSH and POP operation stack pointer register gives the address of memory where the information is to be stored or to be read.
8) The memory location currently provided by stack pointer is called as top of stack.

Q. 14 Accumulator contains data 2A H. What will be content of accumulator after execution of each instruction independently?

(i) CMA (ii) ANI 05 H (iii) STC

Ans. : (i) **CMA :** Complement the accumulator

Before execution : [A] = 2A H = 0 0 1 0 1 0 1 0

Instruction : CMA

After execution : [A] = 1 1 0 1 0 1 0 1 = D5 H

i.e. [A] = D5 H

(ii) **ANI 05 H** : AND immediate data 05 H with [A]

Before execution : [A] = 2A H = 0 0 1 0 1 0 1 0

Instruction : ANI 05 H

2AH = 0 0 1 0 1 0 1 0

AND 05 H = <u>0 0 0 0 0 1 0 1</u>

0 0 0 0 0 0 0 0 = 00 H

i.e. [A] = 00 H

(iii) **STC :** Set carry

Before execution : [A] = 2AH

Instruction : STC

This instruction will only set carry flag to 1 and contents of accumulator will remain as it is.

After execution : [A] = 2AH

i.e. [A] = 2AH and [Cy] = 1

Q. 15 **Accumulator contains data E3H. What will be the content of accumulator after stepwise execution of each of following instructions ?** **(Oct. 2008)**

(i) ANI 58 H **(ii) RRC** **(iii) CMA**

Ans. : (i) ANI 58 H : Logically ANDed 58 H with [A]

Before execution : [A] = E3H

Instruction : ANI 58 H

E3 H = 1 1 1 0 0 0 1 1

AND 58 H = <u>0 1 0 1 1 0 0 0</u>

0 1 0 0 0 0 0 0 = 40 H

After execution [A] = 40 H

(ii) **RRC :** Rotate accumulator right by one bit.

Before execution : [A] = 40 H = 010000000

Instruction : RRC

After execution [A] = 0 0 1 0 0 0 0 0 = 20 H

and [Cy] = 0 H

$\therefore$ [A] = 20 H

(iii) **CMA :** Complement the contents of accumulator

Before execution : [A] = 20 H = 0 0 1 0 0 0 0 0

Instruction : CMA

After execution : [A] = 1 1 0 1 1 1 1 1 = DFH□ A] = DFH

Q. 16 **The accumulator in 8085 contains the data B8H and register B contains data 40 H. What will be the content of accumulator after execution of each of the following instructions independently ?** **(March 200[illegible])**

(a) RLC **(b) ORI 29 H** **(c) ANA B**

Ans. :

(a) **RLC :** Rotate accumulator left through carry.

Before execution : [A] = B8H = 10111000

Instruction : RLC

After execution : [A] = 0 1 1 1 0 0 0 1 = 71 H

∴ [A] = 71 H and [Cy] = 1 H

(b) **ORI 29 H :** Logically ORed 29 H with [A]

Before execution : [A] = B8H = 10111000

Instruction : ORI 29 H

$$\begin{array}{rl} \text{B8H} & = 10111000 \\ \text{OR 29 H} & = \underline{00101001} \\ & 10111001 = \text{B9H} \end{array}$$

After execution : [A] = B9H

(c) **ANA B :** Logically AND [Reg. B] with [A]

Before execution : [A] = B8H = 1 0 1 1 1 0 0 0

[Reg. B] = 40 H = 0 1 0 0 0 0 0 0

Instruction : ANA B

$$\begin{array}{rl} & 10111000 \\ \text{AND} & \underline{01000000} \\ & 00000000 = 00\text{ H} \end{array}$$

After execution :

[A] = 00 H

Q. 17 **The accumulator contains the data A4H. What will be its contents after execution of following instructions independently.** **(Oct. 02)**

i) XRI 08H ii) CMA iii) SUB A

Ans. :

Accumulator = A4 H

= 1010 0100

i) **XRI 08 H :**

Logically Ex-ORed 08H with contents of accumulator.

Before execution : [A] = A4 H

Instruction : XRI 08 H

$$\begin{array}{rl} \text{A4 H} & = 10100100 \\ \text{XOR} \quad \text{08 H} & = \underline{00001000} \\ & 10101100 \\ & = \text{ACH} \end{array}$$

After execution : [A] = ACH

ii) CMA :

Complement the accumulator

Before execution : [A] = A4 H

= 10100100

Instruction : CMA

After execution :

[A] = 01011011

= 5B H

i.e. [A] = 5B H

iii) SUB A :

Subtract accumulator from itself.

Before execution : [A] = A4 H

Instruction : SUB A

$$\begin{array}{lrl} [A] : A4\ H & = & 10100100 \\ 2\text{'s complement of A4} & = & 01011100 \\ +[A] : A4 & = & \underline{10100100} \\ & \boxed{1} & 00000000 \end{array}$$

complement carry ↓

$$\boxed{0} \quad 00000000$$

Result [A] = 00 H

Q. 18 The accumulator of 8085 contains data 43H. What will be its contents after the execution of following instructions independently ?

(i) CMA (ii) ANI 09H (iii) INR A **(Oct. 03)**

Ans. :

i) **CMA :** Before executions accumulator content is :

[A] = 43 H

= 01000011

CMA instruction complements the contents of accumulator and result is stored in the accumulator itself.

[A] = 10111100

= BCH

∴ After execution : [A] = BCH

ii) **ANI 09H :** This instruction logically ANDed 09H with the contents of accumulator.

Before execution : [A] = 43 H

= 0 1 0 0 0 0 1 1

[A] = 43H = 0 1 0 0 0 0 1 1

AND 09H = 0 0 0 0 1 0 0 1

0 0 0 0 0 0 0 1 = 01 H

∴ After execution : [A] = 01H

iii) **INR A :** This instruction increments the contents of accumulator by one and result stored in the accumulator itself.

Before execution :

[A] = 43 H = 0 1 0 0 0 0 1 1

[A] = 43 H = 0 1 0 0 0 0 1 1

\+ 0 1H = 0 0 0 0 0 0 0 1

0 1 0 0 0 1 0 0 = 44 H

∴ After execution : [A] = 44 H

Q. 19 The accumulator of 8085 microprocessor contains the data 45 H and register E contains the data 7BH. What will be the content of accumulator after execution of each of following instructions independently ? (Mar. 04, 2011)

Ans. : (i) XRA E : This instruction logically EX-ORed the contents of register E i.e. 7BH with the contents of accumulator i.e. 45H.

Before execution :

[A] = 45H = 0 1 0 0 0 1 0 1

[E] = 7BH = 0 1 1 1 1 0 1 1

Then, 45 H = 0 1 0 0 0 1 0 1

XOR, 7BH = 0 1 1 1 1 0 1 1

0 0 1 1 1 1 1 0 = 3E H

So after execution of instruction,

[A] = 3E H

(ii) **ADI C5H :**

This instruction adds the data C5H to the content of accumulator i.e. 45H.

[A] = 45H = 0 1 0 0 0 1 0 1

+C5H = 1 1 0 0 0 1 0 1

0 0 0 0 1 0 1 0 = 0A H

After execution,[A] = 0 0 0 0 1 0 1 0

= 0A H

(iii) ORI 5BH :

This instruction logically ORed the data 5BH with the content of accumulator i.e. 45H.

$$\begin{aligned} [A] = 45H &= 01000101 \\ OR\ 5BH &= \underline{01011011} \\ & \quad 01011111 = 5F\,H \end{aligned}$$

After execution, [A] = 01011111 = 5F H

Q. 20 Accumulator of 8085 contains data 56 H. What will be the contents after the execution of following instruction independently. **(March 2005)**

(i) CMA (ii) ANI ACH (iii) INR A

Ans. : [A] = 56H = 01010110

(i) CMA :

This instruction complements the contents of accumulator and result is placed in accumulator itself.

$$[A] = 56\,H = 01010110$$

After execution : CMA

$$\begin{aligned} [A] = 10101001 &= A9\,H \\ \therefore [A] &= A9H \end{aligned}$$

(ii) ANI ACH :

This instruction is logically ANDed ACH with the contents of accumulator.

Before execution :

$$\begin{aligned} [A] = 56\,H &= 01010110 \\ Data = ACH &= 10101100 \\ [A] = 56\,H &= 01010110 \\ AND\ ACH &= \underline{10101100} \\ & \quad 00000100 = 04\,H \end{aligned}$$

After execution : [A] = 04 H

(iii) INR A : This instruction increments the contents of accumulator by one and result stored in the accumulator itself.

Before execution :

$$\begin{aligned} [A] &= 56\,H = 01010110 \\ [A] = 56\,H &= 01010110 \\ +01H &= \underline{00000001} \\ & \quad 01010111 = 57\,H \end{aligned}$$

∴ After execution : [A] = 57 H

Q. 21 If ACC contains data BCH, register C contains ADH. What will be the content of accumulator after execution of each of the following instructions independently?
(i) SUB C (ii) CMA (iii) XRA C (Mar. 06)

Ans. : Accumulator = BCH = 1 0 1 1 1 1 0 0

(i) **SUB C** : Subtract contents of register C from accumulator.

Before execution :

[A] = BCH = 1 0 1 1 1 1 0 0

[C] = ADH = 1 0 1 0 1 1 0 1

Instruction : SUB C

	[A] = BCH	=	1 0 1 1 1 1 0 0
	[C] = ADH	=	1 0 1 0 1 1 0 1
1's complement of	[C]	=	0 1 0 1 0 0 1 1
	[A]	=	1 0 1 1 1 1 0 0
2's complement of	[C]	=	0 1 0 1 0 0 1 1
	$\boxed{1}$		0 0 0 0 1 1 1 1
complement carry ↓			
	$\boxed{0}$		0 0 0 0 0 1 1 1 1
Result	[A]	=	0 0 0 0 1 1 1 1 = 0F H

(ii) **CMA** : Complement the accumulator.

Before execution :

[A] = BCH = 1 0 1 1 1 1 0 0

Instruction : CMA

After execution :

[A] = 0 1 0 0 0 0 1 1 = 43 H

Result = [A] = 43H

(iii) **XRA C** : Logically Ex-ORed contents of C with contents of accumulator..

Before execution : [A] = BCH

Instruction XRA C

	[A] = BCH	=	1 0 1 1 1 1 0 0
XOR	[C] = ADH	=	1 0 1 0 1 1 0 1
			0 0 0 1 0 0 0 1
		=	11 H

After execution : [A] = 11 H

Q. 22 The accumulator of 8085 processor contains data B8H and register B contains 44 H. What will be the content of accumulator after execution of each of the following instruction independently ? **[March 2013]**

(i) ORI F0H (ii) ANA B (iii) XRI 0FH

Ans. :

Accumulator A = B 8 H =1011 1000

(i) ORI F0 H — logically OR ed F0 H with [A]

B8 H = 10 11 1000

ORI F0 H = 11 11 0000

11 11 1000 = F 8 H

After execution [A] = F 8 H

(ii) ANA B – Logically AND (Reg B) with [A]

B8 H = 10 11 1000

AND B – 44 H = 01 00 0100

00 00 0000 = 00 H

After execution [A] = 00 H

(iii) XRI 0F H – Logically Ex-ored 0F H with [A]

B8 H = 10 11 1000

XRI 0F H = 00 00 1111

10 11 0111 = B 7 H

After execution [A] = B7 H

Q. 23 If Accumulator Contains the Data 23H and B Register Contains 35H. What will be the contents of Accumulator. After execution of each of the following instruction independently : **[Oct. 2013]**

(i) XRA (ii) ANI FOH (iii) CPI OAH

Ans. :

A = 23 H = 0010 0011

B = 35 H = 0011 0101

(i) XRA B – Ex.ored reg. B with contents of A.

23 H = 0010 0011

XOR with 35 H = 0011 0101

= $\underbrace{0001}_{1}$ $\underbrace{0110}_{6}$

A = 16 H

(ii) ANIFOH – Logically AND FOH with contents of A.

FO = 1111 0000

AND 23 = 0010 0011

0010 0000

2 0

A = 20 H

(iii) CPIOAH – Compare OAH with A reg.

A = 23 H ← Before execution

While compairing Accumulator remains

Unchanged hence A = 23 H

Q. 24 Accumulator contents are B8H and Register B contents are C9H. What are the contents of Accumulator and Flag register after execution of instructions ANA B, SUB B independently. (March 2014)

Ans. :

(A) = B8H = 10111000

(B) = C9H = 11001001

.) ANAB : Logically AND with Accumulator

1011 1000

1100 1001

1000 1000

A = 88H

Flags → S = 1, Z = 0, AC = 0, P = 1, CY = 0

(2) SUB B : Subtract B Reg. from Accumulator

B = 1100 1001

1's complement of B = 0011 0110

+ 1 + 1

2's complement of B 0011 0111

Add A with 2's complement of B

0011 0111

+ 1011 1000

$\boxed{0}$ 1110 1111

Complement carry ↓

$\boxed{1}$ 1110 1111

Result → A = EFH

Flags → S = 1, Z = 0, AC = 0, P = 0, CY = 1

Q. 25 For the following instructions, write the addressing mode, instruction group and the length of the instruction (in terms of bytes). (Oct. 05)

(i) LHLD ABCDH (ii) LDAX B

(iii) LXI H, BABAH (iv) SPHL

Ans. : (i) LHLD ABCDH : Please refer Appendix I (9).

(ii) **LDAX B** : Please refer Appendix I (11).

(iii) **LXI H, BABAH** : Please refer Appendix I (6).

(iv) **SPHL** : Please refer Appendix V (6).

Q. 26 The following instructions are intended to clear ten (10) memory locations starting from the memory address 0009H. Explain why a large memory block will be erased or cleared and the program will stay in an infinite loop. (Oct. 05)

LXI H, 0009H

Loop MVI M, 00H

DCX H

JNZ Loop

HLT

Ans. :

(1) In given loop, large memory block will be erased or cleared and the program will stay in an infinite loop.

(2) In the given loop, the sequence is repeated by the instruction JNZ (Jump on No zero) until the count becomes zero. However, the instruction DCX does not set the zero flag. Therefore, the instruction JNZ would be unable to recognize when the count has reached zero and the program would remain in a continuous loop.

Q. 27 Explain following instructions of 8085 microprocessor. (March 2002)

(i) ORI data (ii) STAX rp (iii) LHLD addr

Ans. : Refer Appendix

Q. 28 What are different addressing modes ? Which type of addressing mode is used for following instructions ? (Oct. 1998)

(i) XCHG (ii) XRI (iii) SUB M (iv) CMC

Ans. : Refer Q.1 and appendix.

Q. 29 Identify the addressing modes of the following instructions and justify your answer. (i) LDA 2000 H (ii) LDAX B (iii) STC (iv) ADC D (March 1998)

Ans. : Refer appendix – to find addressing mode and refer Q. 2 to justify answer.

Q. 30 Describe following instructions of 8085 microprocessor. (Oct. 2002)

(i) XCHG (ii) RAR (iii) ADC R

Ans. : Please refer appendix.

Q. 31 Explain the following instructions of 8085 microprocessor with suitable example.
(i) RLC (ii) DAA **(Oct. 2002)**

Ans. : Refer appendix.

Q. 32 Explain the following instructions. **(March 2003)**
(i) PCHL (ii) PUSH PSW (iii) OUT (iv) NOP

Ans. : Refer appendix.

Q. 33 Explain the addressing modes of following instructions : **(Oct. 2006)**
(i) LDA (ii) STAX (iii) CMA

Ans. : Refer appendix.
i) Group I (7) ii) Group I (12) iii) Group III (17)

Q. 34 Accumulator contains 45H [(A) = 45], Register E contains data 3BH [(E) =3B] Write the contents of Accumulator after execution of following instructions independently : i) SUB E ii) XRA E iii) RRC iv) MOV E,A **(Oct. 2009, 2010)**

Ans : a)
[A] = 45 H = 0100 0101
[E] = 3BH = 0011 1011

i) SUB E : Subtract contents of register E from accumulator.
[A] = 45 H = 0100 0101
[E] = 3BH = 0011 1011

2's complement of [E]
= 1's complement of [E] + 1
= 1 1 0 0 0 1 0 0 + 1
= 1 1 0 0 0 1 0 1

∴ [A] = 0 1 0 0 0 1 0 1
2's complement of [E] = 1 1 0 0 0 1 0 1
= $\boxed{1}$ 0 0 0 0 1 0 1 0
complement carry $\boxed{0}$ 0 0 0 0 1 0 1 0
∴ Result [A] = 0 0 0 0 1 0 1 0
= 0 A H

ii) **XRA E :** Logically Ex–ORed contents of E with contents of accumulator.
[A] = 45 H = 0 1 0 0 0 1 0 1
XOR [E] = 3BH = 0 011 1011
0111 1110 = 7E H

Result : [A] = 7EH

iii) RRC : Rotate accumulator right by one bit
Before execution :
[A] = 45 H = 0 1 0 0 0 1 0 1
After execution :
[A] = 1 0 1 0 0 0 1 0
= A2 H
∴ [A] = A2H

iv) **Mov E, A :** Copy accumulator contents to register E.
Before execution :
[A] = 45 H = 0 1 0 0 0 1 0 1
[E] = 3BH = 0 0 1 1 1 0 1 1

After execution :

[A] = 45 H = 0 1 0 0 0 1 0 1

[E] = 45 H = 0 1 0 0 0 1 0 1

∴ [A] = 45H

Q. 35 The accumulator contains 05H and register B contains 08H. What will be the effect of 'SUB B' instruction on flags ? Explain it with diagram. (March 2010)

Ans : ACC = 05 H = 0000 0101

B = 08 H = 0000 1000

After execution of SUB B

Accumulator contains 2's compliment of magnitude of result

i.e. ACC = 1111 1101 = FDH

Mentioning the status of carry flag

Q. 36 Differentiate DAD and ADD Instruction of 8085 Micro-Processor (Oct. 2013)

Ans. :

	DAD	ADD
1.	In this instruction contents of register pair rp are added to the contents of HL pair & result is placed in register H and L.	In this instruction register r or content of memory location whose address is stored in H-L pair is added with content of accumulator and result is placed in accumulator.
2.	Only carry flags in affected.	All flags are affected.
3.	Register pairs BC, DE are used.	Only register A, B, C, D, H, E, L are used.
4.	Used for 16 bit addition	Used for 8 bit addition

Q. 37 Differentiate between PUSH and POP. (Oct. 2013)

Ans. :

	PUSH	POP
1.	The contents of the higher order register of register pair rp are moved to memory location whose address is one less than the content of stack pointer.	The contents of the memory location whose address is specified by the stack pointer are moved to low order register of register pair rp.
2.	The contents of the low order register of register pair rp are moved to the memory location whose address is two less than the content of stack pointer.	The contents of the memory location, whose address is one more than the content of stack pointer are moved to high order register of register pair rp.
3.	In this instruction, stack pointer is decremented by two.	In this instruction, stack pointer is incremented by two.
4.	Let [SP] = D015, [B] = 25 H and [C] = 55 H After execution of PUSH B [D014] = 25 H [D013] = 55H and [SP] = D013 H	Let [SP] = 2001 H [2001] = 10 H, [2002] = 20 H After execution of POP H [H] = 20H, [L] = 10H [SP] = 2003 H

Q. 38 The accumulator of 8085 contains data B7h. What will be its contents after execution of the following instructions independently ?

(i) ORI 58 H (ii) CMA (iii) ANI E3 H (March 2012)

Ans. :

Accumulator = B7H

= 10110111

(i) ORI 58 H

Logically ORed 58H with [A]

Before Execution [A] = B7H =1 01 1 0 1 1 1

B7H = 10110111

OR 58H = 01011000

11111111 = FFH

After execution [A] = FFH

(ii) CMA - Complement the contents of accumulator

Before execution [A] = B7H = 1 0 1 1 0 1 1 1

Instruction CMA

After execution [A] = 01001000 = 48 H

(iii) ANIE3H - Logically ANDed E3H with [A]

Before execution [A] = B7H =1 0 1 1 0 1 1 1

Instruction - ANIE3H

B7H = 10110111

OR E3H = 11100011

10100011 = A3H

after execution [A] = A3H

Q. 39 The accumulator contain 3CH, what will be the effect on its content if following instructions are executed independently ? (Oct. 2014)

(i) ANI 05H (ii) RRC (iii) MOV B, A

Ans. : A = 3C H = 00111100

(i) ANI 05 H - Logically And 05 H with Accumulator

05 H = 00000101

A = 00111100 = 3C H

A = 00001000 = 04 H

(ii) RRC - Rotate Accumulator Right

A = 3C H = 00111100

After Execution of RRC A will contain 00011110 = 1E H

(iii) MOV B, A - Move contents of A reg in B register

Accumulator contents remain unchanged i.e. B & A will be 3C H

Q. 40 The accumulator in 8085 Micro-processor contains the data 78H and register D contains data 33H. What will be the content of accumulator after execution of each of the following instructions independently. (Oct. 2015)

(i) SUB D (ii) AND D (iii) CMA

Ans. :

Accumulator = A = 78 H = **0111 1111**

D = 33H = 0011 0011

(ii) SUB D (Subtract D from Accumulator)

is complement of D = 1100 1100

+ 1 + 1

2's Complement of D = 1100 1101

A =

= 0111 11 11

111 11 11

= $\boxed{1}$ 0100 11 00

Complement carry $\boxed{0}$ 0100 1100

Result = A = 4 CH

(ii) AND D : Logically and with accumulator

A = 78 H	=	0111 1111
AND	=	0011 0011
		0011 0011
A	=	33 H

(iii) CMA : Complement Accumulator

A = 78 H	=	0111 1111
After CMA, A	=	1000 0000
A	=	80 H

Q. 41 The accumulator in 8085 microprocessor contains data 71H register E contains data 39H. What will be the contents of accumulator in Hexadecimal after execution of the following instructions independently ? (March 2017)

(i) ADD E (ii) ORA E (iii) RRC

Ans. : (i) AAH, (ii) 79H, (iii) B8H

Q. 42 **Accumulator contains data A4H and Register E contains data 69H write the contents of Accumulator in hex digits after execution of each of the following instructions independently :** **(July 2017)**

Ans. :

(i) ANA E = 20 H (ii) CMP E = A4H (iii) ORA = EDH

Q. 43 **The registers A and C of 8085 contains the data E2H and 47H. What will be the contents of Accumulator in Hex digits after execution of each of the following instructions independently ?** **(March 2018)**

(i) SUB C (ii) XRA C (iii) ADD C

Ans. :

(i) SUB C = 9BH

(ii) XRA C = A5H

(iii) ADD C = 29 H Cy = 1

Q. 44 **Accumulator contain data 45H and register B contain data 82H. What will be the result in Accumulator after execution of each instruction independently.**

(i) XRA B (ii) ADI 54H (iii) NI 57H **(July 2018)**

Ans. :

(i) XRA B

Accumulator =	45H	
reg B =	82H	
Acc = 45H =	0100	0101
B = 82H =	1000	0010
	1100	0111
	B	7

XRA B = B7H

(ii) ADI 54H

Acc = 45H =	0100	0101
54H = 54H =	0101	0100
	1001	1001
	9	9

ADI 54H = 99H

(iii) ANI 57H

Acc = 45H =	0100	0101
57H = 57H =	0101	0111
	0100	0101
	4	5

ANI 57H = 45H

Q. 45 Write the appropriate instructions for the following task : **(July 2018)**

(i) Load accumulator from B register.

(ii) Complement the accumulator

(iii) Add 01H with the accumulator

(iv) Store the content of accumulator at the memory location addressed by the BC register pair.]

(v) Clear the accumulator.

Ans. :

(i)	Load accumulator from B register	–	LDAX B / MOV A, B
(ii)	Complement the accumulator	–	CMA
(iii)	Add 01H with the accumulator	–	ADI 01H
(iv)	Store the content of accumulator at the memory location addressed by the BC register pair.]	–	STAX B
(v)	Clear the accumulator.	–	XRA A / SUB A / MVI A, 00

Q. 46 Give any two instructions of following addressing modes : **(March 2019)**

(i) Immediate (ii) Register Indirect (iii) Register

Ans. :

(i)	Immediate	–	ADI 05H / MVI B, 04H
(ii)	Register Indirect	–	ADD M / MOV M, D
(iii)	Register	–	MOV A, B / ADD C

Q. 47 The accumulator contains AA H and register C contains 55 H. What will be the contents of accumulator if following instructions are executed independently ?

(i) CMP C (ii) ANA C

(iii) ORA C (iv) SUB C **(March 2019)**

Ans. :

(i) CMP C It's CMP means subtraction of A-C. But after subtraction Accumulator content remains unchanged. Means after CMPC.

$$A = AA\,H$$

(ii) ANA C

A = AA H	=	1010	1010	
C = 55 H	=	0101	0101	
logical AND operation	=	0000	0000	

∴ ANA C = 00 H Accumulator Content

(iii) ORA C

A = AA H	=	1010	1010	
C = 55 H	=	0101	0101	
logical OR operation	=	1111	1111	

∴ ORA C = FF H Accumulator Content

(iv) SUB C

A = AA H	=	1010	1010	
C = 55 H	=	0101	0101	
		1010	1010	1's complement
	+		1	Add 1
		1010	1011	2's complement
		1010	1010	1's no.
Substraction		0 0101	0101	∴ SUB C = 55H

Q. 48 Select the correct alternative and rewrite the following.

1 .... instruction belongs to data transfer group of instruction set of 8085.

(i) LHLD (ii) CMA (iii) JMP (iv) POP

Ans. : (i) LHLD

2. .... flag is affected by the instruction RRC of 8085.

(i) zero (ii) parity (iii) carry (iv) all

Ans. : (iii) carry

3. Which of the following instruction does not affect any flag ....

(i) ADD (ii) RAR (iii) STC (iv) PCHL

Ans. : (iv) PCHL

4. Instruction STAX belongs to .... addressing mode.

(i) Direct (ii) Register (iii) Register indirect (iv) Immediate

Ans. : (iii) Register indirect

5. In 8085 .... instruction affects flag register.

(i) MOV B, A (ii) CMA (iii) MVI A, data (iv) CPI data

Ans. : (iv) CPI data

6. Instruction PCHL belongs to .... group

(i) Arithmetic operation

(ii) Logical operation

(iii) Data transfer

(iv) Branching operation

Ans. : (iv) Branching operation

7. LXI H, addr is .... byte instruction. (March 2002)

(i) 1 (ii) 2 (iii) 3 (iv) 4

Ans. : (iii) 3

8. The contents of H-L pair are 29 FF. After execution of the instruction INX H, the contents will be ....
(i) 2A00 (ii) 3000 (iii) 2910 (iv) 2900

Ans. : (i) 2A00

9. DAD instruction only affects .... flag.
(i) Parity (ii) Auxiliary carry (iii) Carry (iv) All of these

Ans. : (iii) Carry

10. After execution of ANA instruction, Cy flag is .... and Ac flag is ....
(i) reset, set (ii) set, reset (iii) set, set (iv) reset, reset

Ans. : (i) reset, set

11. The instruction that can affect the stack pointer is ....
(i) SHLD (ii) XCHG (iii) LXI (iv) LDAX

Ans. : (iii) LXI

12. .... is three byte instruction.
(i) RAR (ii) MOV A, D (iii) SBI 80H (iv) LXI H, 2050H

Ans. : (iv) LXI H, 2050H

13. The invalid register pair for 8085 microprocessor is .... (Mar. 2002, 05)
(i) BC (ii) HL (iii) SP (iv) DE

Ans. : (iii) SP

14. The instruction XRA M comes under the category of .... group. (Oct. 2002)
(i) Data transfer (ii) Branch control (iii) Logical (iv) Arithmetic

Ans. : (iii) Logical

15. The instruction PCHL belongs to ...... addressing mode. (March 2002)
(i) register indirect (ii) direct (iii) register (iv) implicit

Ans. : (iii) register

16. There is no branch instruction based upon the .... flag. (March 2002)
(i) CY (ii) S (iii) AC (iv) P

Ans. : (iii) AC

17. The instruction MOV B, A of 8085 microprocessor is an example of ..... addressing mode.
(i) Direct (ii) Implicit (iii) Register indirect (iv) Register (Oct. 2003)

Ans. : (iv) Register

18. In 8085 microprocessor, flag register is not affected after the execution of .... instruction.
(i) INR r (ii) DCR r (iii) ADD r (iv) INX rp (March 2004)

Ans. : (iv) INX rp

19. ...... of following instruction belongs to register indirect addressing mode. (Oct. 2004)
(i) LXI H, 1050 (ii) MVI A, 05 (iii) CMP B (iv) MOV C, M

Ans. : (iv) MOV C, M

20. The full form of instruction DAA is .... (March 2005)
(i) Double Add Accumulator (ii) Decimal Add Accumulator
(iii) Double Adjust Accumulator (iv) Decimal Adjust Accumulator

Ans. : (iv) Decimal Adjust Accumulator

21. The instruction which does not affect only carry flag is .... (Oct. 2005)
(i) DAD (ii) XRA (iii) CMP (iv) INR

Ans. : (iv) INR

22. .... instruction rotates the contents of ACC left through carry by 1 bit. (March 2006)
(i) RLC (ii) RRC (iii) RAR (iv) RAL

Ans. : (iv) RAL

23. ACC contents remain unchanged on execution of instruction .... (Oct. 2006)
(i) LDAX rp (ii) MOV A, M (iii) CMA (iv) CMP B

Ans. : (iv) CMP B

24. The instruction MOV B, A of 8085 microprocessor is an example of _____ addressing mode. (Oct. 2003)
(i) Direct (ii) Implicit (iii) Register indirect (iv) Register

Ans : (iv) Register

25. In 8085 microprocessor, flag register is not affected after the execution of ____ instruction. (March 2004)
(a) INR r (b) DCR r (c) ADD r (d) INX rp

Ans. : (d) INX rp

26. ______ of following instruction belongs to register indirect addressing mode. (Oct. 2004)
(i) LXI H, 1050 (ii) MVI A, 05 (iii) CMP B (iv) MOV C, M

Ans. : (iv) MOV C, M

27. The full form of instruction DAA is ______ (March 2005)
(i) Double Add Accumulator (ii) Decimal Add Accumulator
(iii) Double Adjust Accumulator (iv) Decimal Adjust Accumulator

Ans. : (iv) Decimal Adjust Accumulator

28. The instruction which does not affect, only carry flag is _______ (Oct. 2005)
(i) DAD (ii) XRA (iii) CMP (iv) INR

Ans. : (iv) INR

29. ____ instruction rotates the contents of ACC left through carry by 1 bit. (March 2006)
(i) RLC (ii) RRC (iii) RAR (iv) RAL

Ans. : (iv) RAL

30. AC contents remain unchanged on execution of instruction ____. (Oct. 2006)
(i) LDAX rp (ii) MOV A, M (iii) CMA (iv) CMP B

Ans. : (iv) CMP B

31. The instruction which affects only carry flag is _______ (March 2007)
(i) OR (ii) XRI (iii) ADI (iv) DAD

Ans. : (iv) DAD

32. instruction uses flags. (March 2007)
(i) Data Transfer (ii) Arithmetical (iii) Conditional jump (iv) Logical

Ans : (iii) Conditional Jump

33. The instruction that can affect stack pointer is ________. (Oct. 2007)
i) SHLD ii) XCHG iii) LXI iv) LDAX

Ans : (iii) LXI

34. The instruction ——— will affect the zero flag without changing the contents of the accumulator. (March 2008)
(i) MVI A, 00 (ii) SUB A (iii) XRA A (iv) CMP A

Ans : b) CMP A

35. XCHG instruction exchanges 16-bit data between ________. (Oct. 2008)
(i) DE and HL Register Pair (ii) BC and HL Register Pair
(iii) BC and DE Register Pair (iv) All of the above Register Pairs

Ans. : (i) DE and HL Register Pair

36. In case of 8085 instructions, STC is an example of ________ addressing mode. (March 2009)
(i) Direct (ii) Register (iii) Implied (iv) Immediate

Ans. (iii) Implied

37. Addressing Mode of ADD M is ______ (Oct. 2009)
(i) Direct (ii) Register Indirect
(iii) Implied (iv) Immediate

Ans. : (ii) Register Indirect

38. ______ of the following instructions is branching instruction. (March 2010)
(i) ADD r (ii) JMP addr (iii) CMP M (iv) CMA

Ans. : (ii) JMP addr

39. In case of 8085 instruction set, CMA is an example of _____ instruction. (Oct. 2010)
(i) Arithmetic (ii) Branching (iii) Logical (iv) Data Transfer

Ans : (iii) Logical

40. During PUSH instruction of 8085, the stack pointer ______ (March 2011)
(i) Increment by 1 (ii) Increment by 2
(iii) Decrement by 1 (iv) Decrement by 2

Ans. : (iv) Decrement by 2

41. PSW is a combination of ______ registers. (March 2011)
(i) M and F (ii) H and F (iii) L and F (iv) A and F

Ans : (iv) A and F

42. The instruction CMA is ______ Byte function. (Oct. 2011)
(i) 1 byte (ii) 2 byte (iii) 3 byte (iv) 4 byte

Ans. : (i) 1 byte

43. _____ instruction is Logical Instruction. (Oct. 2011)
(i) ADD r (ii) MVI r, data
(iii) ANI, data (iv) LX1 rp, data

Ans.: (iii) ANI, data

44. The instruction JNZ of 8085 microprocessor is _____ type of instruction. (March 2012)

(i) Branching (ii) Conditional Branching
(iii) Arithmetic (iv) Data Transfer

Ans.: (ii) Conditional Branching

45. _______ Flag is always reset in ANA instruction. (Oct. 2012)

(i) Carry (ii) Parity (iii) Sign (iv) Zero

Ans.: (i) Carry

46. The flag bit that gets affected on execution of RCC instruction in 8085 Processor is _______. (March 2013)

(i) Zero (ii) Parity (iii) Carry (iv) All

Ans.: (iii) Carry

47. _________ flag is affected in CMA Instruction. (Oct. 2013)

(i) All (ii) No (iii) Carry (iv) Zero

Ans.: (ii) No

48. LXI rp, $Data_{16}$ is __________ byte instruction. (March 2014)

(i) TWO (ii) ONE (iii) THREE (iv) FOUR

Ans.: (iii) THREE

49. ___________ Instruction would not affect zero flag. (March 2015)

(i) XRA A (ii) SUB A (iii) CMP A (iv) MVI A, 00H

Ans.: (iv) MVI A, 00 H

50. After the execution of POP rp instruction, SP gets _______ (Oct. 2015)

(i) Incremented by one (ii) Decremented by one
(iii) Incremented by two (iv) Decremented by two

Ans.: (iii) Incremented by two

51. __________ instruction does not affect the Flag. (March 2016)

(i) RAR (ii) CMP C (iii) XRA (iv) MOV A,B

Ans.: (iv) MOV A,B

52. ________ instruction is used for 16-bit addition. (March 2016)

(i) ADD (ii) ADI (iii) ADC (iv) DAD

Ans.: (iv) DAD

53. In MOV A, M instruction _____ is used to point the memory location. (July 2016)

(i) HL (ii) PC (iii) SP (iv) PSW

Ans.: (i) HL

54. ANA, r instruction comes under _____ group. (March 2017)

(i) Arithmetic (ii) Logical
(iii) Branch (iv) Data Transfer

Ans.: (ii) Logical

55. __________ is three-byte instruction of 8085. (July 2017)

(i) CMA (ii) ADI
(iii) XCHG (iv) LDA

Ans.: (iv) LDA

56. The instruction PCHL belongs to ________ group. **(March 2018)**

(i) Data transfer (ii) Logical
(iii) Arithmetic (iv) Branching

Ans. : (iv) Branching

57. ________ instruction is a Arithmetic group of instruction. **(July 2018)**

(i) MOV reg, reg (ii) RRC
(iii) NOP (iv) ADD reg.

Ans. : (iv) ADD reg.

58. The first byte of an 8085 instruction always contains ________. **(March 2019)**

(i) Opcode (ii) Data
(iii) Address (iv) None of these

Ans. : (i) Opcode

59. The PUSH PSW instruction of 8085 shall ________ the stack pointer. **(July 2019)**

(i) Increment by two bytes (ii) Decrement by two bytes
(iii) Un affect (iv) None of these

Ans. : (ii) Decrement by two bytes

60. The length of instruction MVI reg. data is ________. **(March 2020)**

(i) 1 Byte (ii) 2 Byte (iii) 3 Byte (iv) 4 Byte

Ans. : (ii) 2 Byte

□□□

Appendix

Instruction set of 8085

I) Data Transfer Group :

1) MOV r_d, r_s : [MOVE REGISTER]

Format : $[r_d] \leftarrow [r_s]$

Addressing : Register addressing

Group : Data transfer group

Bytes : 1 byte

Flag : None

Comment : This instruction will copy destination register with the content of source register. The contents of source register are not altered i.e. they remain unchanged.

r_d and r_s can be of one of the registers A, B, C, D, E, H, L.

Example : Let [A] = 05H and [B] = 55H

Instruction : MOV A, B

After execution : [A] = 55H and [B] = 55H

2) MOV r, M : [MOVE FROM MEMORY]

Format : $[r] \leftarrow [[H\text{-}L]]$

Addressing : Register Indirect addressing

Group : Data transfer group

Bytes : 1 byte

Flag : None

Comment : This instruction will load destination register with content of memory location, whose address is stored in H-L register pair. The contents of memory location are not altered. r can be any one of the registers A, B, C, D, E, H, L.

Example : Let, [H-L] = CFFF H, [CFFF] = 35H and [B] = 82H

Instruction : MOV B, M

After execution : [B] = 35H

[CFFF] = 35H

3) MOV M, r : [MOVE TO MEMORY]

Format : $[[H\text{-}L]] \leftarrow [r]$

Addressing : Register Indirect

Group : Data transfer group

Byte : 1 byte

Flag : None

Comment : This instruction will copy the content of register r to the memory location, whose address is placed in H-L register pair. r can be any one of the A, B, C, D, E, H, L.

Example : Let [HL] = F000H and

[F000] = 40H and [C] = FAH then

Instruction : MOV M, C

After execution : [C] = FAH

[F000] = FAH

4) **MVI r, data :** [MOVE IMMEDIATE 8-BIT]

Format : $[r] \leftarrow$ data (second byte)

Addressing : Immediate addressing

Group : Data transfer group

Bytes : 2 bytes

Flag : None

Comments : This instruction will load the register r with 8-bit immediate data specified in second byte of instruction.

Example : Instruction : MVI A, 35H

This instruction will load accumulator with immediate data 35H.

5) **MVI M, data :** [MOVE IMMEDIATE 8-BIT]

Format : $[[H\text{-}L]] \leftarrow$ data (second byte)

Addressing : Immediate/Register indirect address

Group : Data transfer group

Bytes : 2 bytes

Flag : None

Comment : This instruction will load the memory location, whose address is stored in H-L pair with 8-bit immediate data specified in the second byte of instruction.

Example : Let [H] [L] = D000H

Instruction : MVI M, 35 H

Above instruction will load memory location D000H with immediate data 35 H.

6) **LXI rp, 16-bit data :** [LOAD REGISTER PAIR IMMEDIATE] (Mar. 10, 18, Oct. 08, 21)

Format : $[r_p] \leftarrow$ 16-bit data i.e. $[r_h] \leftarrow$ byte 3, $[r_l] \leftarrow$ byte 2

Addressing : Immediate

Group : Data transfer group

Bytes : 3 bytes

Flag : None

Comment : The byte 3 of instruction is moved into high order register (r_h) of register pair rp and byte 2 is moved into low order register (r_l) of register pair. The register pairs can be BC, DE, HL or SP. [SP (stack pointer) is not a valid register pair, but it can be used in LXI instruction]

Example : LXI H, 3500 H.

This instruction will load H-L pair with 3500 H. 35 H will be loaded in high order register(H) and 00H will be loaded in low order register (L).

7) **LDA addr :** [LOAD ACCUMULATOR DIRECT] (Oct. 2007; March 18)

Format : [A] ← [[byte 3] [byte 2]]

Addressing : Direct addressing mode

Group : Data transfer group

Bytes : 3 bytes

Flag : None

Comment : This instruction will load accumulator with content of memory location, whose address is given in the instruction itself. The contents of memory location are not altered.

Example : Let [C500] = 26 H

Instruction : LDA C500

After execution : [A] = 26 H

[C500] = 26 H

8) **STA addr :** [STORE ACCUMULATOR DIRECT] (March 2018)

Format : [[byte 3] [byte 2]] ← [A]

Addressing : Direct addressing

Group : Data transfer group

Bytes : 3 bytes

Flag : None

Comment : This instruction will load the content of accumulator into the memory location, whose address is specified in the instruction. The contents of accumulator are not altered.

Example : Let [A] = 35 H

Instruction : STA C500 H

After execution : [C500] = 35 H

[A] = 35 H

9) **LHLD addr :** [LOAD H AND L REGISTER DIRECT] (Mar.02, 08,Oct. 03, 04, 08)

Format : [L] ← [[byte 3] [byte 2]]

[H] ← [[byte 3] [byte 2] + 1]

Addressing : Direct addressing

Group : Data transfer group

Bytes : 3 bytes

Flag : None

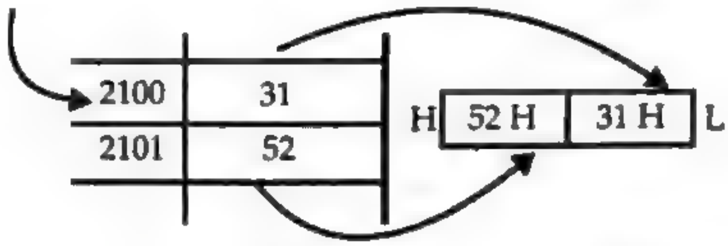
Comment : In this instruction, the first byte gives the opcode and second and third byte give 16-bit address of memory location in usual convention. The contents of memory location whose address is specified in the instruction are loaded into register L and the content of next memory location loaded in register H.

For example :

Let memory location 2100 H contains 31 H and 2101 H contains 52 H then after execution of instruction-

LHLD 2100 H

Register H will contain 52 H and register L will contain 31 H.



10) SHLD addr : [STORE H AND L REGISTERS DIRECT] (March 2004, 2006, Oct. 2007)

Format :	[[byte 3] [byte 2]] ← [L]
	[[byte 3] [byte 2] + 1] ← [H]
Addressing :	Direct addressing
Group :	Data transfer group
Bytes :	3 bytes
Flag :	None

Comment : The contents of register L are transferred to the memory location whose address is specified by byte 2 and byte 3 of the instruction. The contents of register H are moved to succeeding memory location.

Example :	Let [H] = 32 H and [L] = 35 H
Instruction :	SHLD 2100 H
After execution :	[2100] = 35 H
	[2101] = 32 H

11) LDAX rp : [LOAD ACCUMULATOR INDIRECT] (March 2006, Oct. 2007)

Format :	[A] ← [[rp]]
Addressing :	Register indirect
Group :	Data transfer group
Bytes :	1 byte
Flag :	None

Comment : The contents of memory location, whose address is stored in register pair rp are loaded into accumulator. The content of memory location remain unchanged. rp can be B (i.e. B and C) or D (i.e. D and E)

Example : Let [B] = 25 H, [C] = 25 H and [2525] = 33 H

Instruction : LDAX B

After execution : [A] = 33 H

12) **STAX rp : [STORE ACCUMULATOR INDIRECT]** (Mar.2002 Oct. 07, 08)

Format : [[rp]] ← [A]

Addressing : Register Indirect addressing

Byte : 1 byte

Group : Data transfer group

Flag : None

Comment : The contents of accumulator are transferred to the memory location whose address is stored in register pair rp. The valid register pairs are B (i.e. B & C) and D (i.e. D & E)

Example : Let [D] = 25 H and [E] = 25 H, [A] = 55 H

Instruction : STAX D

After execution : [2525] = 55 H

13) **XCHG : [EXCHANGE H AND L WITH D AND E]** (March 2008, 2009 Oct. 2002, 2004)

Format : [H] ← [D]
[L] ← [E]

Addressing : Register

Group : Data transfer group

Bytes : 1 byte

Flag : None

Comment : The contents of register H are exchanged with that of register D and the contents of register L are exchanged with that of register E.

Example : Let [H] = 23 H, [L] = 32 H, [D] = 53 H and [E] = 55 H

Instruction : XCHG

After execution : [H] = 53 H and [L] = 55 H,
[D] = 23 H and [E] = 32 H

II) <u>Arithmetic Group</u> :

1) **ADD r : [ADD REGISTER]**

Format : [A] ← [A] + [r]

Addressing : Register addressing

Group : Arithmetic group

Bytes : 1 byte

Flag : All

Comment : The contents of register r are added to the content of accumulator. The result is stored in accumulator. All the flags may be affected.

Example : Let, [D] = 35 H and [A] = 05 H

Instruction : ADD D

Addition :	35 H	=	0 0 1 1 0 1 0 1
	+ 05H	=	0 0 0 0 0 1 0 1
	3A H	=	0 0 1 1 1 0 1 0

S = 0, Z = 0, AC = 0 P = 1, Cy = 0

After execution :

[A] = 3AH

Flag Register =

0	0	–	0	–	1	–	0

[D] = 35 H

2) **ADD M : [ADD MEMORY CONTENT TO ACCUMULATOR]**

Format : [A] ←[A] + [[H] [L]]

Addressing : Register Indirect addressing

Group : Arithmetic group

Bytes : 1 byte

Flags : All

Comment : The contents of accumulator are added to the content of memory location, whose address is stored in H-L pair. The result is placed in accumulator. All flags may be affected.

Example : Let [H-L] = D000 H, [D000] = 51 H and [A] = 35 H

Instruction : ADD M

After execution : [A] = 86 H and [D000] = 51 H

3) **ADI data : [ADD IMMEDIATE TO ACCUMULATOR]**

Format : [A] ← [A] + data (byte 2)

Addressing : Immediate addressing

Group : Arithmetic group

Bytes : 2 bytes

Flag : All

Comment : This instructions adds the 8-bit immediate data specified in second byte of instruction to the content of accumulator. All flags may be affected.

Example : Let [A] = EAH

Instruction : ADI 15 H

Addition : (A) : EAH = 1 1 1 0 1 0 1 0

Data : + 15 H = 0 0 0 1 0 1 0 1

FFH = 1 1 1 1 1 1 1 1

Flags : S = 1, Z = 0, Ac = 0

P = 1, Cy = 0

After execution : [A] = FFH

4) **ADC r : [ADD REGISTER TO ACCUMULATOR WITH CARRY]** (March 2008, Oct. 200

Format :	[A] ← [A] + [r] + [Cy]
Addressing :	Register addressing
Group :	Arithmetic group
Bytes :	1 byte
Flags :	All

Comment : This instructions adds the content of accumulator to the content of register r and the content of the carry flag. The result is placed in accumulator. All flags may be affected.

Example : Let [A] = 5F H, [D] = 33 H and [Cy] = 01 H

Instruction : ADC D

Addition :

[A] : 5F H = 0 1 0 1 1 1 1 1

[D] : +33H = 0 1 1 0 0 1 1

[Cy] : +01 H = 0 0 0 0 0 0 0 1

[A] = 93 H = 1 0 0 1 0 0 1 1

Flags : S = 1, Z = 0, P = 1,

Ac = 1, Cy = 0

[**Note :** This instructions generally used in 16-bit addition. For examples to add the content of BC register to the content of DE registers, this instruction is used to account for the carry generated by low order byte.]

5) **ADC M : [ADD MEMORY CONTENT TO ACCUMULATOR WITH CARRY]**

Format :	[A] ← [A] + [[H-L]] + [Cy]
Addressing :	Register Indirect
Group :	Arithmetic
Byte :	1 byte
Flag :	All

Comment : The contents of memory location whose address place in H-L register pair and content of Cy flag are added to the content of accumulator. The result is placed in accumulator.

Example : Let [HL] = F000H

[A] = 35 H

[Cy] = 00H, [F000H] = 05 H

Instruction : ADC M

After execution : [A] = 3A H

	S	Z		Ac		P		Cy
Flag =	0	0	–	0	–	1	–	0

6) **ACI data : [ADD IMMEDIATE TO ACCUMULATOR WITH CARRY]**

Format : [A] ← [A] + data + [Cy]

Addressing : Immediate addressing

Group : Arithmetic group

Bytes : 2 bytes

Flags : All

Comment : This instruction adds the content of accumulator to the 8-bit immediate data specified in second byte of instruction along with the content of carry flag. The result is placed in accumulator. All flags may be affected.

Example : Let : [Cy] = 1 H & [A] = 05 H

Instruction : ACI 55 H

After execution : [A] = 5B H

7) **SUB r : [SUBTRACT REGISTER FROM ACCUMULATOR]**

Format : [A] ← [A] – [r]

Addressing : Register addressing

Group : Arithmetic instructions group

Bytes : 1 byte

Flag : All

Comment : The contents of register r are subtracted from the content of accumulator. The result is placed in accumulator. All the flags may be affected.

Example : [A] = 37 H

[C] = 40 H

Instruction : SUB C

[C] : 40 H = 0 1 0 0 0 0 0 0

2' s complement = 1 1 0 0 0 0 0 0

+ [A] : 37 H = 0 0 1 1 0 1 1 1

$\boxed{0}$ 1 1 1 1 0 1 1 1

complement carry ↓

$\boxed{1}$ 1 1 1 1 1 0 1 1 1

Result : [A] = F7 H

Flags : S = 1, Z = 0, Ac = 0,

P = 0, Cy = 1

The result, as a negative number, will be in 2's complement and thus the carry (Borrow) flag is set.

8) **SUB M : [SUBTRACT MEMORY FROM ACCUMULATOR]**

Format :	[A] ← [A] - [[H-L]]
Addressing :	Register Indirect
Group :	Arithmetic Instruction
Byte :	1
Flag :	All

Comment : The content of memory location, whose address stored in H-L register pair is subtracted from the content of accumulator. The result is placed in the accumulator.

Example :	[HL] = 2500 H
	[2500] = 05 H
	[A] = 07 H
Instruction :	SUB M
After execution :	[A] = 02 H

9) **SUI data : [SUBTRACT IMMEDIATE FROM ACCUMULATOR]** (Oct -2010)

Format :	[A] ← [A] - data
Addressing :	Immediate addressing
Group :	Data transfer group
Bytes :	2 bytes
Flag :	All

Comment : The 8-bit immediate data specified in the second byte of the instruction is subtracted from the content of accumulator. Result is placed in accumulator. All the flags may be affected.

Example :	Let, [A] = 1F H
Instruction :	SUI 1FH
After execution :	[A] = 00H

10) **SBB r : [SUBTRACT REGISTER AND BORROW FROM ACCUMULATOR]**

(Mar. 2008, 2009, Oct. 2007)

Format :	[A] ← [A] - [r] - [Cy]
Addressing :	Register addressing
Group :	Arithmetic group
Bytes :	1 byte
Flag :	All

Comment : The contents of register r and carry bit are subtracted from the contents of accumulator. The result is placed in accumulator. All the flags may be affected.

Example :

[A] = 37 H

[B] = 3F H

[Cy] = 01 H

Instruction : SBB B

[B] = 3 F

Borrow : + 1

40 H = 0 1 0 0 0 0 0 0

2 ' s complement of 40 H

$$\begin{array}{rl} & = 11000000 \\ +[A] & = 00110111 \\ \hline \boxed{0} & 11110111 \end{array}$$

Complement carry :

$$\boxed{1} \; 11110111$$

Result : [A] = F7H

The borrow flag is set to indicate the result is in 2• s complement.

11) SBB M : [SUBTRACT MEMORY CONTENT AND BORROW FROM CCUMULATOR]

Format : [A] ← [A] - [[H][L]] - [Cy]

Addressing : Register Indirect addressing

Group : Arithmetic group

Bytes : 1 byte

Flag : All

Comment : The contents of memory location whose address is stored in H-L pair along with carry bit are subtracted from the contents of accumulator. Result is placed in accumulator. All the flags may be affected.

Example : Let [H-L] = 2500 H, [2500] = 05 H,
[A] = 07 H and [Cy] = 0.
Instruction : SBB M
After execution : [A] = 02 H

12) SBI data : [SUBTRACT IMMEDIATE WITH BORROW]

Format : [A] ← [A] - data - [Cy]

Addressing : Immediate addressing

Group : Arithmetic group

Bytes : 2 bytes

Flag : All

Comment : The 8-bit immediate data, specified in the second byte of instruction is subtracted along with the carry bit from the content of accumulator. The result is placed in accumulator. All the flags may be affected.

Example : Let [A] = 32 H, [Cy] = 1 H
Instruction : SBI 31 H
After execution : [A] = 0

13) INR r : [INCREMENT REGISTER CONTENT BY 1]

Format : [r] ← [r] + 1

Addressing : Register addressing

Group : Arithmetic group

Bytes : 1 byte

Flag : S, Z, P, Ac

Comment : The contents of register r are incremented by one and the results are stored in the same place. All the flags except carry flag may be affected. The register r can be A, B, C, D, E, H and L.

Example : Let [B] = FFH

Instruction : INR B

After execution : [B] = 00H

Flag : S = 0, P = 0, Ac = 0, Cy = 0, Z = 1

14) INR M : [INCREMENT MEMORY CONTENT BY 1]

Format : [[H] [L]] ← [[H] [L]] + 1

Addressing : Register indirect

Group : Arithmetic instruction

Byte : 1 byte

Flag : S, Z, P, Ac except Cy

Comment : The content of memory location whose address is stored in H-L register pair is incremented by one and result again i.e.stored on the same place.

Example : [H-L] = 2500 H

[2500] = 04 H

Instruction : INR M

After execution : [2500] = 05 H

INX rp : [INCREMENT REGISTER PAIR BY 1] (March 2019)

Format : [rp] ← [rp] + 1

Addressing : Register addressing

Group : Arithmetic group

Bytes : 1 byte

Flag : None

Comment : This instruction increments the content of register pair rp by 1. No flags are affected. The instruction views the contents of the two registers as a 16-bit number.

Example : Let [HL] = D000 H

Instruction : INX H

After execution : [HL] = D001 H

16) DCR r : [DECREMENT REGISTER BY 1]

Format : [r] ← [r] – 1

Addressing : Register

Group : Arithmetic

Byte : 1 byte

Flag : S, Z, P, Ac except Cy

Comment : The content of register is decremented by 1 and the results are stored in the same place.

Example : [D] = 00H

Instruction : DCR D

[D] : 00 H = 0 0 0 0 0 0 0 0

\- 01 H = 0 0 0 0 0 0 0 1

Subtraction is performed in 2's complement

	[D]	= 00000000
		+
2's complement of 1		11111111
	[D]	= 11111111

After execution : [D] = FFH

17) **DCR M : [DECREMENT MEMORY CONTENT BY 1]**

Format : [[H][L]] ← [[H][L]] - 1

Addressing : Register indirect addressing

Group : Arithmetic group

Bytes : 1 byte

Flag : S, Z, Ac, P except Cy

Comment : This instruction decrements the content of memory location, whose address is stored in H-L pair by 1 and the result is placed at same place. All flags except carry flag are affected.

Example : Let [H-L] = D000H and [D000] = 2A H

Instruction : DCR M

After execution : [D000] = 29 H

18) **DCX rp : [DECREMENT REGISTER PAIR BY 1]**

Format : [rp] ← [rp] - 1

Addressing : Register addressing

Group : Arithmetic group

Bytes : 1 byte

Flag : None

Comment : This instruction decrements the content of register pair rp by 1. No flags are affected. This instruction views the contents of the two registers as a 16-bit number.

Example : Let [DE] = D000 H

Instruction : DCX D

After execution : [DE] = CFFF H

19) **DAD rp : [ADD REGISTER PAIR TO H AND L REGISTER]**

(March 04, 05 Oct. 04,09; July 17)

Format : [H][L] ← [H][L] + [rh] [rl]

Addressing : Register addressing

Group : Arithmetic group

Bytes : 1 byte

Flag : Cy

Comment : The contents of register pair rp are added to the contents of H-L pair. Result is placed in register H and L. Only carry flag is affected.

Example : Let, [H] = 03 H, [L] = 05, [D] = 15 H and [E] = 12 H.

Instruction : DAD D

After execution : [L] = 05 + 12 = 17 H

[H] = 03 + 15 = 18 H

∴ [H-L] = 1817 H

In this case, carry flag is reset.

20) DAA : [DECIMAL ADJUST ACCUMULATOR] (Oct. 02, 03, Mar. 08)

Addressing :	Implied addressing
Group :	Arithmetic group
Bytes :	1 byte
Flag :	All

Comment : The eight bit number in the accumulator is adjusted to form two four-bit Binarycoded Decimal digits by this instruction. It can be done by following process :

If the value of the least significant 4 bits of the accumulator ($A_3 - A_0$) is greater than 9 or if the AC flag is set, 6 (06) is added to low order 4-bits of accumulator.

If the value of most significant 4-bits of the accumulator ($A_7 - A_4$) is greater than 9 or if the Cy flag is set, 6 (60) is added to the high order 4-bits of accumulator.

3) If both 4 LSBs and 4 MSBs of accumulator are greater than 9 or Ac and C flags are set respectively then 66 add to the accumulator content.

[**Note :** This instruction must always follow an addition instruction for two BCD numbers. It can not be used to adjust results after subtraction.]

Example :

Add 12_{BCD} to 39_{BCD}

$$\begin{array}{rcl} 39_{BCD} & = & 0\,0\,1\,1\,1\,0\,0\,1 \\ \underline{+12}_{BCD} & = & \underline{0\,0\,0\,1\,0\,0\,1\,0} \\ 51_{BCD} & = & 0\,1\,0\,0\,1\,0\,1\,1 = 4BH \end{array}$$

The binary sum is 4B H. But BCD sum is 51

To adjust result add 6 to lower nibble

$$\begin{array}{rcl} 4B & = & 0\,1\,0\,0\,1\,0\,1\,1 \\ \underline{+06} & = & \underline{0\,0\,0\,0\,0\,1\,1\,0} \\ 51 & = & 0\,1\,0\,1\,0\,0\,0\,1 \end{array}$$

Thus [A] = 51 i.e. contents are adjusted to BCD values.

III) Logical Group :

1) ANA r : [LOGICAL AND WITH ACCUMULATOR] (July 2018, Oct. 2021)

Format :	[A] ← [A] $\wedge$ [r]
Addressing :	Register addressing

Group : Logical group

Bytes : 1 byte

Flag : S, Z, P are modified Cy = 0, Ac = 1

Comment : The contents of accumulator are logically ANDed with the content of register r. Result is placed in accumulator. S, Z, and P flags are modified. The Cy flag is reset and Ac flag is set. X-OR

Example : Let, [A] = 25 H and [B] = 31 H

Instruction : ANA B

[A] : 25 H = 0 0 1 0 0 1 0 1

AND [B] : 31 H = 0 0 1 1 0 0 0 1

0 0 1 0 0 0 0 1 = 21 H

After execution : [A] = 21 H

Flags : S = 0, Z = 0, P = 1,

Ac = 1, Cy = 0

Input		and	OR	Ex-OR
A	B	$A \wedge B$	$A \vee B$	$A \oplus B$
0	0	0	0	0
0	1	0	1	1
1	0	0	1	1
1	1	1	1	0

{Cy = 0} {AC = 1} — for AND gate

{Cy = 0} {AC : 0} — for OR gate

2) **ANA M : [LOGICAL AND WITH MEMORY]**

Format : $[A] \leftarrow [A] \wedge [[H][L]]$

Addressing : Register indirect addressing

Group : Logical group

Bytes : 1 byte

Flags : S, Z, P modified Cy = 0, Ac = 1

Comment : The contents of accumulator are logically ANDed with the content of memory location, whose address is stored in H-L pair. The result is placed in accumulator. The S, Z and P flags are modified. The Cy flag is reset and the Ac flag is set.

Example : Let [A] = 3B H, [H-L] = D000 H and [D000] = 29 H

Instruction : ANA M

[A] : 3B H = 0 0 1 1 1 0 1 1

AND 29 H = 0 0 1 0 1 0 0 1

0 0 1 0 1 0 0 1 = 29 H

After execution : [A] = 29 H

Flags : S = 0, Z = 0, P = 0

Ac = 1, Cy = 0

3) **ANI data : [AND IMMEDIATE WITH ACCUMULATOR]** (Mar.04, Oct. 06)

Format : $[A] \leftarrow [A] \wedge$ data

Addressing : Immediate addressing

Group : Logical group

Bytes : 2 bytes.

Flags : S, Z, P are modified Cy = 0, Ac = 1

Comment : The contents of accumulator are logically ANDed with the 8-bit immediate data specified in the second byte of the instruction. The result is placed in the accumulator. The S, Z, and P flags are modified. Cy flag is cleared and Ac flag is set.

Example : Let [A] = 11 H

Instruction : ANI 11 H

After execution : [A] = 11 H

4) **ORA r :** [LOGICALLY OR WITH ACCUMULATOR] (July 2018)

Format : $[A] \leftarrow [A] \vee [r]$

Addressing : Register addressing

Group : Logical group

Bytes : 1 byte

Flags : Z, S, P are modified. Ac and Cy are reset

Comment : The contents of accumulator are logically Inclusive ORed with the contents of register r. The result is placed in accumulator. r may be any one of A, B, C, D, E, H and L registers. Ac and Cy flags are reset.

Example : Let [A] = 29 H and [B] = 35 H

Instruction : ORA B

[A] : 29 H = 0 0 1 0 1 0 0 1

OR [B] : 35 H = 0 0 1 1 0 1 0 1

0 0 1 1 1 1 0 1 = 3D H

After execution : [A] = 3D H

Flags : S = 0, Z = 0, P = 0, Ac = 0, Cy = 0

5) **ORA M :** [LOGICALLY OR WITH MEMORY]

Format : $[A] \leftarrow [A] \vee [[H] [L]]$

Addressing : Register Indirect

Group : Logical

Byte : 1

Flags : Z, S, P are modified, Ac and Cy are reset

Comment : The contents of accumulator are logically ORed with the contents of memory location, whose address is placed in H-L register pair. The result is placed in accumulator. Ac and Cy flags are reset.

Example : [A] = 03 H

[H-L] = D000H

[D000] = 81 H

Instruction : ORA M

03 H = 0 0 0 0 0 0 1 1

OR 81 H = 1 0 0 0 0 0 0 1

83 H = 1 0 0 0 0 0 1 1

After execution [A] = 83 H

Flags : S = 1, Z = 0, P = 0, Cy = 0, Ac = 0

6) **ORI data :** [LOGICALLY OR IMMEDIATE] (March 2002)

Format : [A] ← [A] ∨ data

Addressing : Immediate addressing

Group : Logical group

Bytes : 2 bytes

Flags : S, Z, P are modified, Cy and Ac are reset.

Comment : The contents of accumulator are logically ORed with the 8-bit immediate data specified in the second byte of the instruction. The result is placed in accumulator. The S, Z and P flags are affected. The Cy and Ac flags are reset.

Example : Let, [A] = 35 H

Instruction : ORI 99H

[A] = 35 H = 0 0 1 1 0 1 0 1

OR 99 H = 1 0 0 1 1 0 0 1

1 0 1 1 1 1 0 1 = BD H

After execution : [A] = BDH

Flags : S = 1, Z = 0, P = 1, Ac = 0, Cy = 0

7) **XRA r :** [EXCLUSIVE OR WITH ACCUMULATOR] (March 2006, July 2018)

Format : [A] ← [A] ∨ [r]

Addressing : Register addressing

Group : Logical group

Bytes : 1 byte

Flags : S, Z, P are modified, Cy = 0, Ac = 0

Comment : The contents of accumulator are logically exclusive-ORed with the contents of register r. The result is placed in accumulator. The r may be any one of the A, B, C, D, E, H and L register. The Cy and Ac flags are reset.

Example : Let [A] = 25 H and [B] = 39 H

Instruction : XRA B

[A] : 25 H = 0 0 1 0 0 1 0 1

[B] : 39 H = 0 0 1 1 1 0 0 1

0 0 0 1 1 1 0 0 = 1C H

After execution : [A] = 1C H

Flags : S = 0, Z = 0, P = 0, Ac = 0, Cy = 0

8) **XRA M :** [EXCLUSIVE OR WITH MEMORY] (Oct. 03, 2010 Mar. 05)

Format : [A] ← [A] ∨ [[H-L]]

Addressing : Register Indirect

Group : Logical

Byte : 1 byte

Flags : S, P, Z are modified Cy and Ac are reset.

Comment : The content of the accumulator are logically exclusive OR-ed with the content of the memory location whose address placed in H-L register pair. The result is placed in the accumulator. The Cy and Ac flags are reset.

Example : Let [A] = 77 H

[H-L] = D000H

[D000] = 56 H

Instruction : XRA M

[A] : 77 H = 0111 0111

[D000] : 56 H = <u>0101 0110</u>

0010 0001

After execution : [A] = 21 H

Flags : S = 0, Z = 0, P = 1, Cy = 0, Ac = 0

XRI data : [EXCLUSIVE OR IMMEDIATE WITH ACCUMULATOR]

Format : $[A] \leftarrow [A] \vee data$

Addressing : Immediate addressing

Group : Logical group

Bytes : 2 bytes

Flags : S, Z, P are modified Ac = 0, Cy = 0

Comment : The content of accumulator are logically exclusive- OR'ed with the 8-bit immediate data specified in second byte of instruction. The result is placed in accumulator. The S, Z, and P flags are affected. The Cy and Ac flags are reset.

Example : Let [A] = 5B H

Instruction XRI 35 H

[A] : 5B H = 01011011

Data 35 H = <u>00110101</u>

01101110 = 6E H

After execution : [A] = 6E H

Flags : S = 0, Z = 0, P = 0, Cy = 0, Ac = 0

10) **CMP r** : [COMPARE WITH ACCUMULATOR] (Oct. 04, Mar.05)

Format : [A] - [r]

Addressing : Register addressing

Group : Logical group

Bytes : 1 byte

Flag : All

Comment : This instruction compares the content of the register with content of accumulator. Comparison is done using subtraction of content of register from the content of accumulator. The content of accumulator remains unchanged.

The result of comparison is shown by setting the flags as :

(a) If [A] < [r] then Cy flag is set to 1

(b) If [A] = [r] then Z flag is set to 1

(c) If [A] > [r] then Z and Cy flags are reset

The 'r' may be any one of the A, B, C, D, E, H and L register.

Example : Let [A] = 15 H and [H] = 57 H

Instruction : CMP H

After execution : Cy = 1, Z = 0

11) **CMP M : [COMPARE MEMORY WITH ACCUMULATOR]**

Format :	[A] - [[H-L]]
Addressing :	Register indirect addressing
Group :	Logical group
Bytes :	1 byte
Flags :	All

Comment : This instruction compares the content of memory location whose address is stored in H-L pair with the content of accumulator by subtracting the content of memory location from the content of accumulator. The content of accumulator remains unchanged.

The result of comparison is shown by setting the flags as below :

(a) The zero flag is set to 1 if [A] = [[H][L]]

(b) The Cy flag is set to 1 if [A] < [[H][L]].

(c) Both Cy and Z flags are reset if [A] > [[H][L]]

12) **CPI data : [COMPARE IMMEDIATE WITH ACCUMULATOR]**

Format :	[A] - data
Addressing :	Immediate addressing
Group :	Logical group
Bytes :	2 byte
Flags :	All

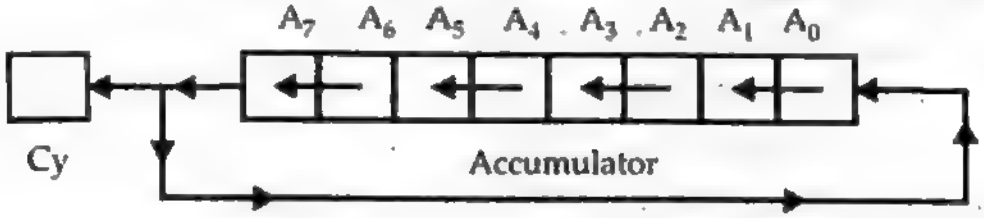
Comment : This instruction compares the 8-bit immediate data, specified in the second byte of instruction, by subtracting it from the contents of accumulator. The content of accumulator remains unchanged. The result of comparison is shown by setting flags as :

1) If the contents of accumulator are equal to 8-bit immediate data, then zero flag is set.
2) If the contents of accumulator are less than the 8-bit immediate data, then carry flag is set.
3) Else, both flags are reset.

13) RLC : [ROTATE ACCUMULATOR LEFT] **(Oct. 02)**

Format :	$[A_{n+1}] \leftarrow [A_n]$, $[A_0] \leftarrow [A_7]$, $[C_y] \leftarrow [A_7]$
Addressing :	Implied addressing
Group :	Logical group
Bytes :	1 byte
Flag :	Only Cy

Comment : The contents of accumulator are rotated to left by one bit position. The bit A_7 is stored in bit A_0 as well as in carry flag. It is shown in following figure :



Example : Let [A] = 93 H and [Cy] = 0

Instruction : RLC

Before instruction :

Cy	A_7							A_0
0	1	0	0	1	0	0	1	1

Accumulator

After execution : RLC

Cy	A_7							A_0
1	0	0	1	0	0	1	1	1

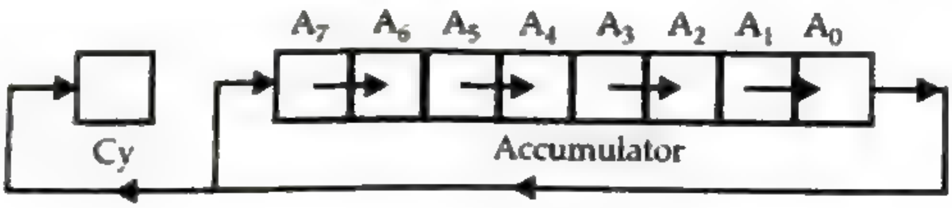
Accumulator

Thus [A] = 27 H and Cy = 1

14) RRC : [ROTATE ACCUMULATOR RIGHT] **(Mar. 2004, 2020)**

Format :	$[A_n] \leftarrow [A_{n+1}]$, $[A_7] \leftarrow [A_0]$, $[C_y] \leftarrow [A_0]$
Addressing :	Implied addressing
Group :	Logical group
Bytes :	1 byte
Flag :	Cy

Comment : The contents of accumulator are rotated right by one bit position. The bit A0 of accumulator is stored in the bit A7 as well as in carry flag. Only the Cy flag is affected. The function of RRC is shown in the following figure.



Example : [A] = 83 H [Cy] = 0

Cy		A_7							A_0
0		1	0	0	0	0	0	1	1

Cy Accumulator

Instruction : RRC

After execution :

Cy									
1		1	1	0	0	0	0	0	1

Cy Accumulator

Thus [A] = C1H, [Cy] = 1

15) RAL : [ROTATE ACCUMULATOR LEFT THROUGH CARRY] (Oct. 03,09; July 17)

Format : $[A_{n+1}] \leftarrow [A_n]$, $[A_0] \leftarrow [Cy]$, $[Cy] \leftarrow [A_7]$

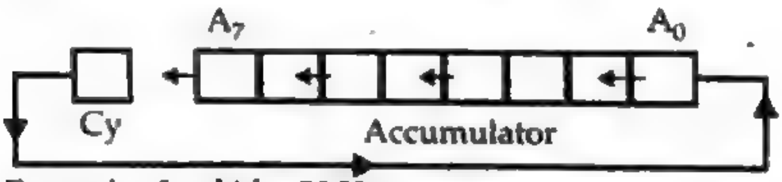
Addressing : Implied addressing

Group : Logical group

Bytes : 1 byte

Flag : Cy

Comment : This instruction rotates the content of accumulator one position left through carry flag. The carry flag status is stored in bit A0 of accumulator and the bit A7 of accumulator is stored in carry flag. The function of RAL is shown in following figure :



Example : Let [A] = 29 H,

[Cy] = 1 H

Cy									
1		0	0	1	0	1	0	0	1

Cy Accumulator

Instruction : RAL

Cy									
0		0	1	0	1	0	0	1	1

Cy Accumulator

Thus [A] = 53 H

[Cy] = 0

16) RAR : [ROTATE ACCUMULATOR RIGHT THROUGH CARRY]

(Oct. 2002, March 2005, 2008)

Format : $[A_n] \leftarrow [A_{n+1}]$, $[A_7] \leftarrow [Cy]$, $[Cy] \leftarrow [A_0]$

Addressing : Implied addressing

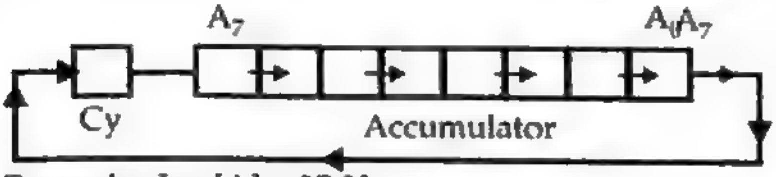
Group : Logical group

Bytes : 1 byte

Flag : Cy

Comment : The contents of the accumulator are rotated to right by one bit position through carry flag. The carry flag status is stored in bit A7 of accumulator and the bit A0 of accumulator is stored in carry flag. Only the carry flag is affected.

The function of RAR is shown in the following figure.



Example : Let [A] = 3B H,
[Cy] = 0 H

Cy								
0	0	0	1	1	1	0	1	1

Cy Accumulator

Instruction : RAR

Cy								
1	0	0	0	1	1	1	0	1

Cy Accumulator

Thus [A] = 1D H
[Cy] = 1

CMA : [COMPLEMENT THE ACCUMULATOR] (March 2020)

Format : $[A] \leftarrow [\overline{A}]$
Addressing : Implied addressing
Group : Logical group
Bytes : 1 byte
Flag : None

Comment : This instruction complements the content of accumulator. Result is placed in the accumulator.

Example : Let, [A] = 3B H = 0 0 1 1 1 0 1 1
Instruction : CMA
After execution : [A] = 1 1 0 0 0 1 0 0
i.e. [A] = C4 H

18) CMC : [COMPLEMENT CARRY] (Oct. 03, March 05; July 17)

Format : $[Cy] \leftarrow [\overline{Cy}]$
Group : Logical group
Bytes : 1 byte
Flag : Cy

Comment : The carry flag is complemented. No other flags are affected.

Example : Let [Cy] = 1 H
Instruction : CMC
After execution : [Cy] = 0 H

19) STC : [SET CARRY] (March 2009,2006, 2020)

Format : $[Cy] \leftarrow 1$
Addressing : Implied addressing

Group : Logical group
Bytes : 1 byte
Flag : Cy
Comment : This instruction sets carry flag to 1. No other flags are affected.

IV) Branching Group :

1) JMP addr. : [JUMP UNCONDITIONALLY]

Format : [PC] ← addr
Addressing : Immediate addressing
Group : Branching group
Bytes : 3 bytes
Flag : None
Comment : The control is transferred unconditionally to the memory location, whose address is specified in the instruction.

2) Jcondition addr. : [Conditional JUMP]

Format : [PC] ← addr
Addressing : Immediate adressing
Group : Branching group
Bytes : 3 bytes
Flags : None

In conditional jump instructions, the jump is taken only if the condition is true. The conditional jump instructions and conditions are as given below.

i)	JNZ addr	:	Jump on not zero (Z = 0)
ii)	JZ addr	:	Jump on zero (Z = 1)
iii)	JNC addr	:	Jump on not carry (Cy = 0)
iv)	JC addr	:	Jump on carry (Cy = 1)
v)	JPO addr	:	Jump on odd parity (P = 0)
vi)	JPE addr	:	Jump on even parity (P = 1)
vii)	JP addr	:	Jump on plus (S = 0)
viii)	JM addr	:	Jump on minus (S = 1)

If the condition is satisfied, then only the address of memory location specified in the instruction is loaded in program counter.

3) CALL addr. : [UNCONDITIONAL SUBROUTINE CALL]

Format : $[[SP] - 1] \leftarrow [PC_H]$
$[[SP] - 2] \leftarrow [PC_L]$
$[SP] \leftarrow [SP] - 2$
$[PC] \leftarrow addr$

Addressing : Immediate addressing
Group : Branching group
Bytes : 3 bytes

Comment : CALL instruction is used to call a subroutine unconditionally. Before the control is transferred to the subroutine, the address of next instruction to be executed of the main program is stored in the stack. The contents of SP are decremented by 2. Then, the program jumps to the subroutine whose starting address is specified in the instruction.

4) Ccondition addr. : [Conditional CALL]

Format : $[[SP]-1] \leftarrow [PC_H]$

$[[SP]-2] \leftarrow [PC_L]$

$[SP] \leftarrow [SP]-2$

$[PC] \leftarrow addr$

The conditional call instructions and conditions are listed below :

i) CC addr : Call if carry (Cy = 1)

ii) CNC addr : Call if no carry (Cy = 0)

iii) CZ addr : Call if zero (Z = 1)

iv) CNZ addr : Call if no zero (Z = 0)

v) CP addr : Call if plus (S = 0)

vi) CM addr : Call if minus (S = 1)

vii) CPO addr : Call if odd parity (P = 0)

viii) CPE addr : Call if even parity (P = 1)

5) RET : [RETURN FROM SUBROUTINE]

Format : $[PCL] \leftarrow [[SP]]$,

$[PCH] \leftarrow [[SP]+1]$

$[SP] \leftarrow [SP]+2$

Addressing : Register indirect

Group : Branching group

Bytes : 1 byte

Comment : The contents of memory location, whose address is specified in stack pointer are moved to the lower order byte of program counter. The content of the memory location whose address is one more than the content of SP, moved to the higher order byte of program counter. The contents of stack pointer are incremented by 2.

6) Rcondition : [Conditional RETURN]

Format : $[PCL] \leftarrow [[SP]]$

$[PCH] \leftarrow [[SP]+1]$

$[SP] \leftarrow [SP]+2$

Addressing : Register Indirect

Bytes : 1

Flag : None

Comment : If the specified condition is true, the actions specified in RET are performed. Otherwise the control continues sequentially.

Opcode	Description	Flag
RC	Return on Carry	Cy = 1
RNC	Return with no carry	Cy = 0
RP	Return on positive	S = 0
RM	Return on minus	S = 1
RPE	Return on parity even	P = 1
RPO	Return on parity odd	P = 0
RZ	Return on zero	Z = 1
RNZ	Return on no zero	Z = 0

7) RST n : [RESTART]

Format : $[[SP] - 1] \leftarrow [PC_H]$

$[[SP] - 2] \leftarrow [PC_L]$

$[SP] \leftarrow [SP] - 2$

$[PC] \leftarrow 8^*(n)$

Addressing : Register Indirect

Byte : 1

Flag : None

Comment : Control is transferred to the instruction whose address is 8 times the content of n. These instructions are used with interrupts.

Opcode	Operand	Restart addr.
RST	0	0000
RST	1	0008
RST	2	0010
RST	3	0018
RST	4	0020
RST	5	0028
RST	6	0030
RST	7	0038

8) PCHL : [LOAD PROGRAM COUNTER WITH HL] (Oct. 2021)

Format : $[PC_H] \leftarrow [H]$

$[PC_L] \leftarrow [L]$

Addressing : Register addressing

Group : Branching group

Bytes : 1 byte

Flag : None

Comment : This instruction moves the content of register H to higher order byte of program counter and the content of register L to lower order byte of program counter.

This instruction is equivalent to one byte unconditional jump instruction, with jump address. stored in H-L pair.

Example : Let, [H] = 25 H and [L] = 39 H

Instruction : PCHL

After execution : [PC] = 2539 H

After execution of PCHL instruction, the control will be transferred to memory location 2539 H.

V) Machine Control Group :

A) Stack operation :

1) PUSH rp : [PUSH REGISTER PAIR ON STACK] (Mar. 04, 06)

Format : [[SP] - 1] ← [rh]

[[SP] - 2] ← [rl]

[SP] ← [SP] - 2

Addressing : Register indirect addressing

Bytes : 1 byte

flags : None

Comment : (a) The contents of the higher order register of register pair rp are moved to memory location, whose address is one less than the content of stack pointer.

(b) The contents of the low order register of register pair rp are moved to the location whose address is two less than the content of stack pointer.

(c) The stack pointer is decremented by two. rp may be any one of the B (B & C), D (D &E), H (H & L).

Example : Let [SP] = D015 H, [B] = 25 H and [C] = 55 H

Instruction : PUSH B

After execution : [D014] = 25 H

[D013] = 55 H

and [SP] = D013 H

		Stack
SP →	D013	55
	D014	25
	D015	X

2) PUSH PSW : [PUSH ACCUMULATOR AND FLAG REGISTER ON STACK] (March 2003, 2004)

Format : [[SP] - 1] ← [A]

$[[SP]-2]_0 \leftarrow [Cy]$, $[[SP]-2]_1 \leftarrow x$,

$[[SP]-2]_2 \leftarrow [P]$, $[[SP]-2]_3 \leftarrow x$,

$[[SP]-2]_4 \leftarrow [Ac]$, $[[SP]-2]_5 \leftarrow x$,

$[[SP]-2]_6 \leftarrow [Z]$, $[[SP]-2]_7 \leftarrow [S]$,

$[SP] \leftarrow [SP] - 2$ (x - Undefined)

Addressing : Register indirect addressing

Bytes : 1 byte

Flag : None

Comment : (a) The contents of accumulator are moved to the memory location, whose address is one less than the content of stack pointer.

(b) The contents of processor status word (flag register) are moved to the memory location, whose address is two less than the content of stack pointer.

(c) The stack pointer is decremented by 2.

Example : Let [A] = 33 H and Flag Register = 25 H, [SP] = D015

Instruction : PUSH PSW

After execution : [D014] = 33 H, [D013] = 25 H

[SP] = D013 H

3) **POP rp** : [POP OFF STACK TO REGISTER PAIR] (Oct. 2003)

Format : $[rl] \leftarrow [[SP]]$

$[rh] \leftarrow [[SP] + 1]$

$[SP] \leftarrow [SP] + 2$

Addressing : Register indirect

Bytes : 1 byte

Flag : None

Comment : (a) The contents of the memory location, whose address is specified by the stack pointer are moved to low order register of register pair rp.

(b) The contents of the memory location, whose address is one more than the content of stack pointer are moved to high order register of register pair rp.

(c) The stack pointer is incremented by 2.

rp may be any one of the pairs B (B & C), D (D & E) and H (H & L)

Example : Let [SP] = 2001 H

Instruction : POP H

Before Execution

	Stack	
2001	10	← SP
2002	20	
2003		

[SP] = 2001

After Execution

	stack	
2001	10	
2002	20	
2003		← SP

[SP] = 2003

[H] = 20 H [L] = 10 H

4) **POP PSW** : [POP OFF STACK TO ACCUMULATOR AND FLAG REGISTER]

Format : $[Cy] \leftarrow [[SP]]0$

$[P] \leftarrow [[SP]]_2$, $[Ac] \leftarrow [[SP]]_4$

$[Z] \leftarrow [[SP]]_6$, $[S] \leftarrow [[SP]]_7$

$[A] \leftarrow [[SP] + 1]$,

$[SP] \leftarrow [SP] + 2$

Addressing : Register indirect

Bytes : 1 byte

Flag : None

Comment :

(a) The contents of the memory location, whose address is specified by the content of register stack pointer are used to restore the condition flags.

(b) The contents of memory location, whose address is one more than stack pointer are Zmoved to accumulator.

(c) The contents of stack pointer are incremented by 2.

5) **XTHL : [EXCHANGE H AND L WITH TOP OF STACK]** (Oct. 06, Mar. 09, 2010)

Format : $[L] \leftrightarrow [SP]$

$[H] \leftrightarrow [[SP] + 1]$

Addressing : Register Indirect

Bytes : 1 byte

Flag : None

Comment : The contents of the L register are exchanged with the content of the memory location, whose address is stored in stack pointer. The contents of the H register are exchanged with the contents of the memory location, whose address is one more than the contents of the stack pointer. Content of SP are not altered.

Example : Let [H] = 20 H, [L] = FFH, Stack : -

AB	← SP
CD	

Instruction : XTHL

[H] = CDH [L] = ABH Stack

FE	← sp
20	

6) **SPHL : [MOVE HL TO SP]** (Mar. 2006, 2010)

Format : $[SP_L] \leftarrow [L]$

$[SP_H] \leftarrow [H]$

Addressing : Register addressing

Group : Machine control group [stack operation]

Bytes : 1 byte

Flag : None

Comment : This instruction copies the content of register L into lower order byte of stack pointer and the content of register H into higher order byte stack pointer. The contents of register H and L are not affected. This instruction is used for initializing the stack pointer.

Example : Let, [H] = 25 H and [L] = 59 H

Instruction : SPHL

After execution : [SP] = 2559 H

B) Other Instructions : (I/O)

1) IN port : [INPUT 8-BIT DATA FROM AN INPUT PORT TO ACCUMULATOR]

Format : [A] ← data

Addressing : Direct addressing

Group : Machine (I/O) control group

Bytes : 2 bytes

Flags : No flags are affected.

Comment : When this instruction is executed, microprocessor sends 8-bit port address on lower order address bus i.e. A_0 to A_7. Then, the 8-bit data placed on the 8-bit bidirectional data bus by the specified port is moved to accumulator.

e.g. IN 10 H

When this instruction is executed, 8-bit data is inputed from a port, whose address is 10 H.

2) OUT port : [OUTPUT 8-BIT DATA FROM ACCUMULATOR TO AN OUTPUT PORT]

(March . 03)

Format : (data) ← [A]

Addressing : Direct addressing

Group : Machine (I/O) control group

Bytes : 2 bytes

Flags : No flags are affected.

Comment : When this instruction is executed, microprocessor sends 8-bit port address on the lower order address bus AD_0 to AD_7. 8-bit data is then transferred from accumulator to selected port.

Example : OUT 32 H

When this instruction is executed, microprocessor sends 8-bit data from accumulator to the port, whose address is 32 H.

3) EI : [ENABLE INTERRUPT]

Group : Machine control group

Bytes : 1 byte

Flag : None

Comment : EI means Interrupt Enable. The interrupt system is enabled following the execution of the instruction next to EI and all interrupts are enabled.

4) DI : [DISABLE INTERRUPT]

Group : Machine control group

Bytes : 1 byte

Flag : None

Comment : DI means disable interrupts. As soon as DI instruction is executed, the interrupt, system is disabled. Interrupts are not recognized during the DI instruction.

5) **HLT : [HALT AND ENTER WAIT STATE]**

Group : Machine control group
Bytes : 1 byte
Flag : None

Comment : When HLT instruction is executed, the processor is stopped. The registers and flags are unaffected. This instruction is used to stop MPU. It is waiting for a peripheral device to finish its task and interrupt the processor. This is generally the last instruction of our assembly language program. An interrupt or reset is necessary to exit from Halt state.

6) **NOP : [NO OPERATION]** (Mar. 2003)

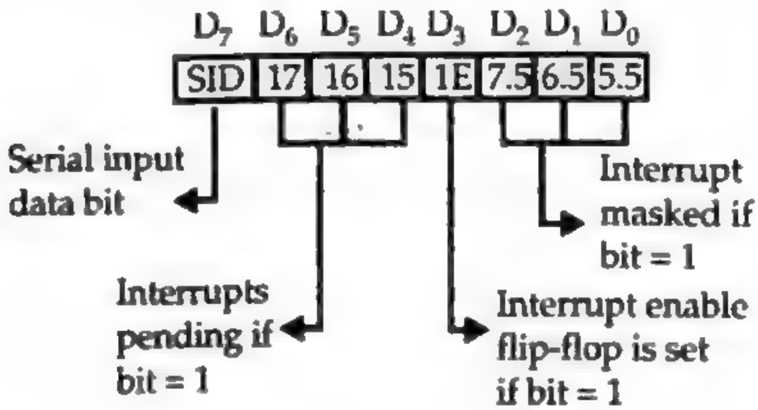
Group : Machine control group
Bytes : 1 byte
Flag : None

Comment : When this instruction is executed, no operation is performed, only this instruction is fetched and decoded. This instruction do not affect flags or content of registers. This instruction is useful to produce a time delay in a timing loop.

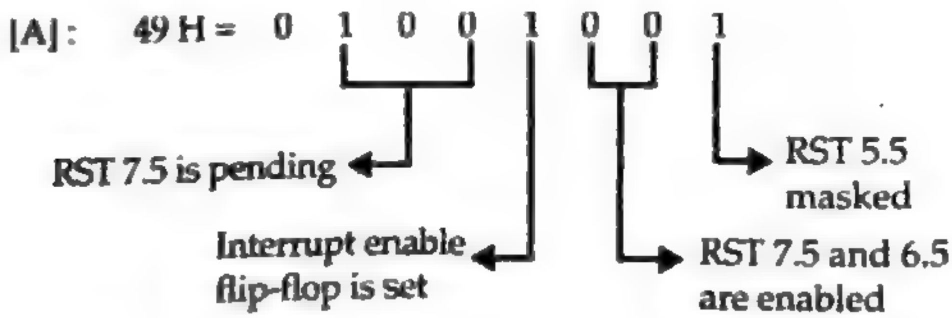
7) **RIM : [READ INTERRUPT MASK]**

Group : Machine control group
Bytes : 1 byte
Flag : None

Comment : This is a multipurpose instruction used to read the status of interrupts 7.5, 6.5, 5.5 and read serial data input bit. The instruction loads eight bits in the accumulator with the following interpretations :



Example : After the execution of instruction RIM, the acumulator contained 49H Explain the accumulator contents.



8) SIM : [SET INTERRUPT MASK] **(Mar.2010)**

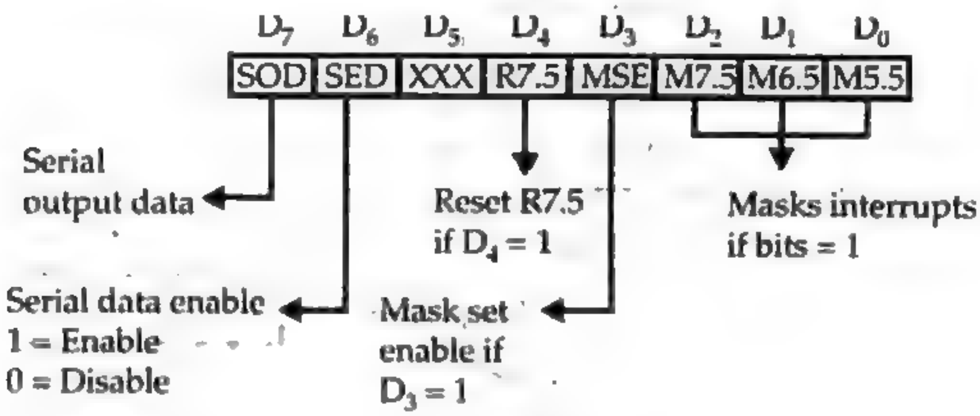
Group : Machine control group

Bytes : 1 byte

Flag : None

Comment : This is a multipurpose instruction and used to implement the 8085 interrupts (RST 7.5, 6.5 and 5.5) and serial data output.

The instruction interrupts the accumulator contents as follows :



SOD : Serial Output Data : Bit D_7 of the accumulator is latched into the SOD output line and made available to a serial peripheral if bit $D_6 = 1$.

SDE : Serial Data Enable : If this bit = 1, it enables the serial output. To implement serial output, this bit needs to be enabled.

XXX : Don't Care

R7.5 : Reset RST 7.5 : If this bit = 1, RST 7.5 flip-flop is reset. This is an additional control to reset RST 7.5.

MSE : Mask Set Enable : If this bit is high, it enables the functions of bits D_2, D_1, D_0. This is a master control over all the interrupt masking bits. If this bit is low, bits D_2, D_1 and D_0 do not have any effect on the masks.

M7.5 : D_2 = 0, RST 7.5 is enabled.
= 1, RST 7.5 is masked or disabled.

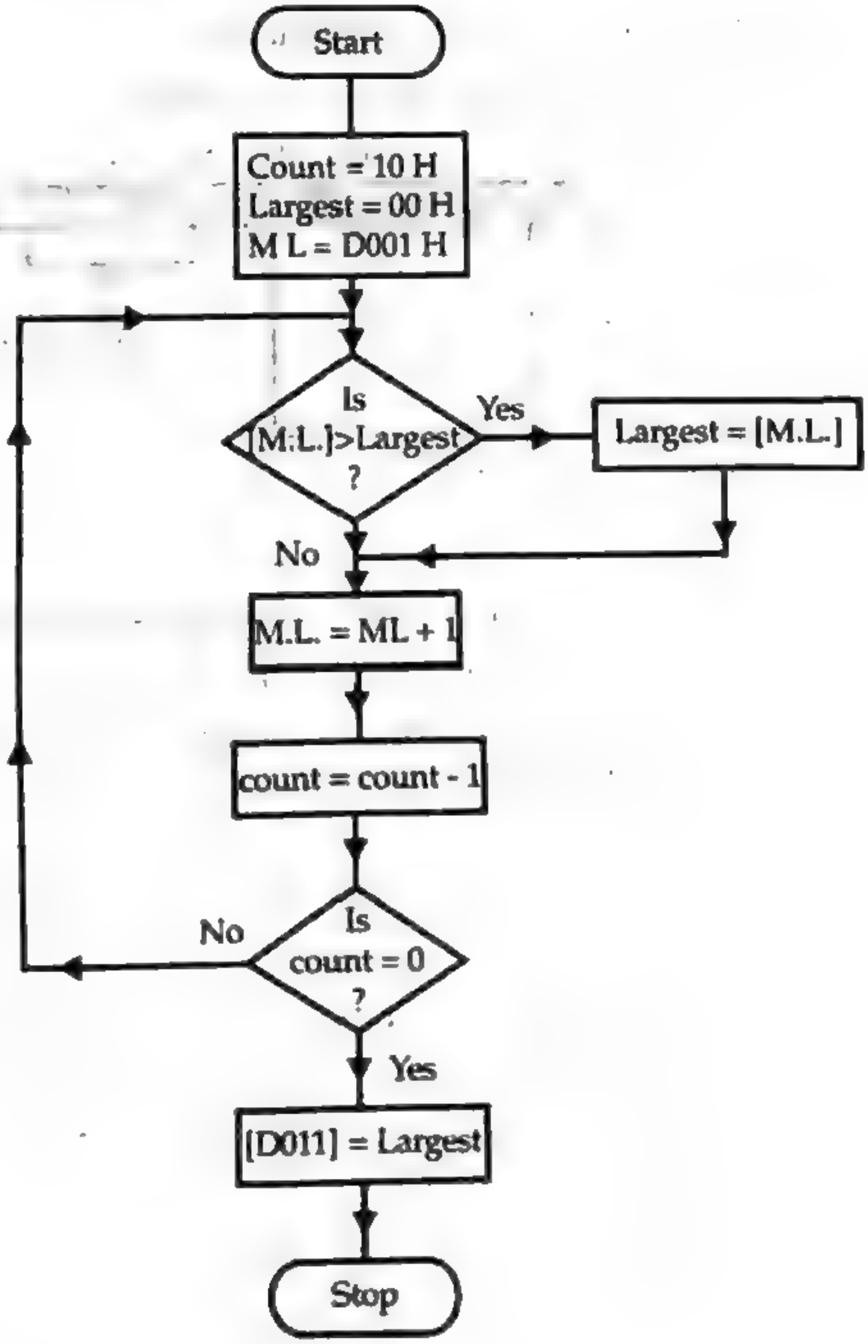
M6.5 : D_1 = 0, RST 6.5 is enabled.
= 1, RST 6.5 is masked or disabled.

M5.5 : D_0 = 0, RST 5.5 is enabled.
= 1, RST 5.5 is masked or disabled.

Assembly Language Programs

1) **A series of numbers are stored in memory from D001 H to D010 H. Write a program in assembly language to find largest number among these numbers. Store the largest number in memory location D011H.**

Flow chart :



Assembly language program :

Memory address	Label	Mnemonics	Comments
C000		LXI H, D001H	; Set H-L pair to D001H
C003		MVI A, 00H	; Largest = 00 H
C005		MVI C, 10H	; Set Count = 10 H
C007	Loop	CMP M	; Compare with previous no. Is it greater ?
C008		JNC AHEAD	; No larger is in Acc. Go to AHEAD.
C00B		MOV A, M	; get larger no. in acc
C00C	AHEAD	INX H	; Address of next memory
C00D		DCR C	; Count = Count - 1
C00E		JNZ Loop	; Repeat if count ≠ 0
C011		MOV M A	; Store largest no in M. L. D011
C012		HLT	; Stop

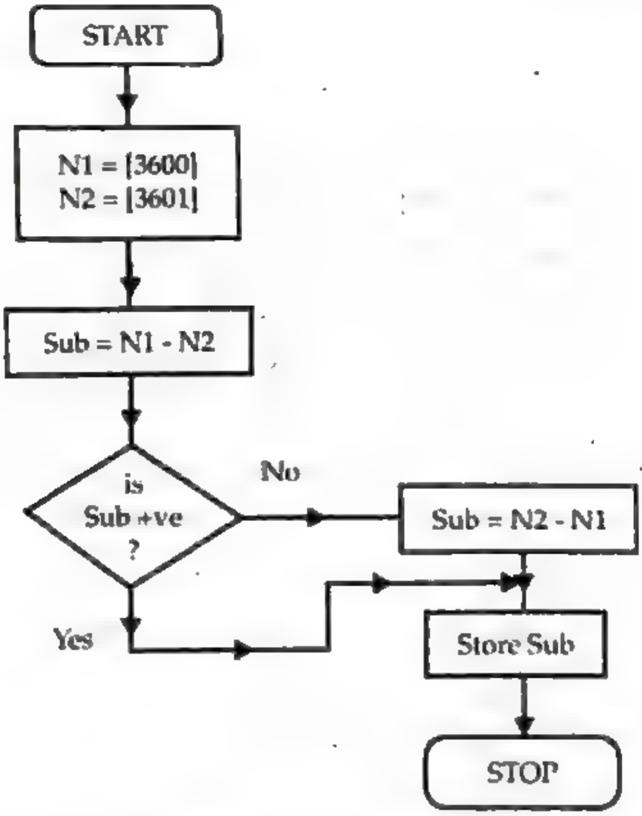
Note : To find smallest number, initially set smallest = FFH.
i.e. change instruction
C003 MVI A, FFH; smallest = FFH
And set smallest = [M.L.] if smallest > [M.L.]
i.e. change instruction
C008 JC AHEAD; Yes, smallest is in acc.

2) **Write an assembly language program to subtract the number stored in memory location 3601 from the number stored in memory location 3600 H. Store the positive result at location 3602 H.** (Mar 02)

Assembly language program

Memory address	Label	Mnemonics	Comments
C000		LXI H, 3600H	; Set H-L pointer to 3600H
C003		MOV A, M	; Take 1st no. in Acc
C004		INX H	; Increment H L contents
C005		SUB M	; Substract IInd no. from Ist no.
C006		JP escape	; escape if result is positive
C009		MOV A M	; If result is negative then
C00A		DCX H	Substract Ist no. from IInd
C00B		SUB M	number
C00C	escape	STA 3602 H	; Store the +ve result at memory location 3602H
C00F		HLT	; Stop

Flowchart :

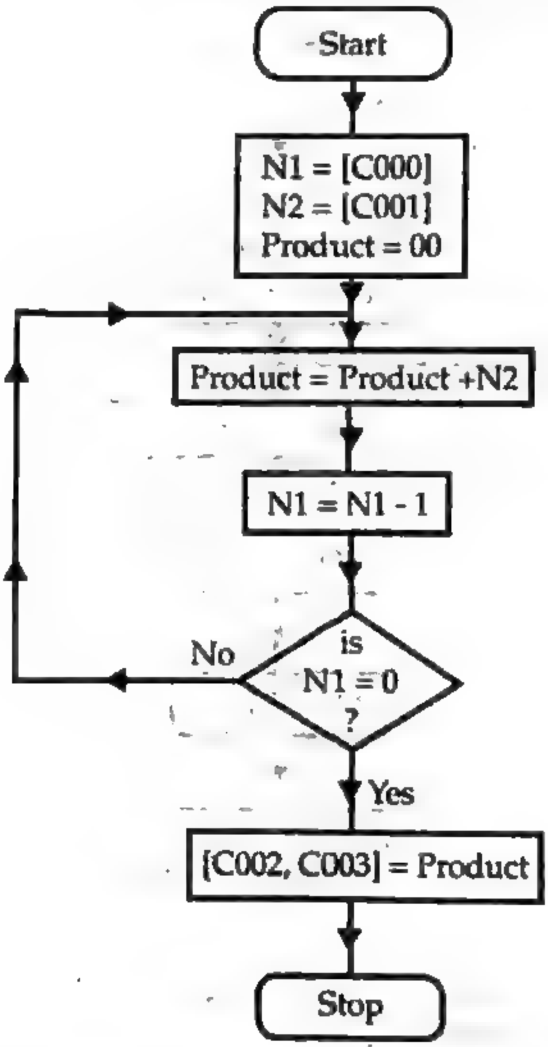


3) **Write a program in assembly language that multiply two 8-bit hex numbers stored in memory locations C005H and C006H. Store the two byte result in consecutive memory locations starting from C000H.** (March 2003,2005)

Assembly language program :

Memory address	Label	Mnemonics	Comments
D000		LXI H , 0000H	; Set initial product = 0
D003		LDA C005 H	; Set [Acc] = N1
D006		MOV E, A	; Set [E] = N1
D007		LDA C006 H	; Set [Acc] = N2
D00A		MVI D, 00H	; Set [D] = 00H
D00C	Loop	DAD D	; product = product + N1
D00D		DCR A	; N2 = N2 - 1
D00E		JNZ Loop	; Repeat, if $N_2 \neq 0$
D011		SHLD C000 H	; Store product in C000 and C001
D014		HLT	; Stop

Flowchart :

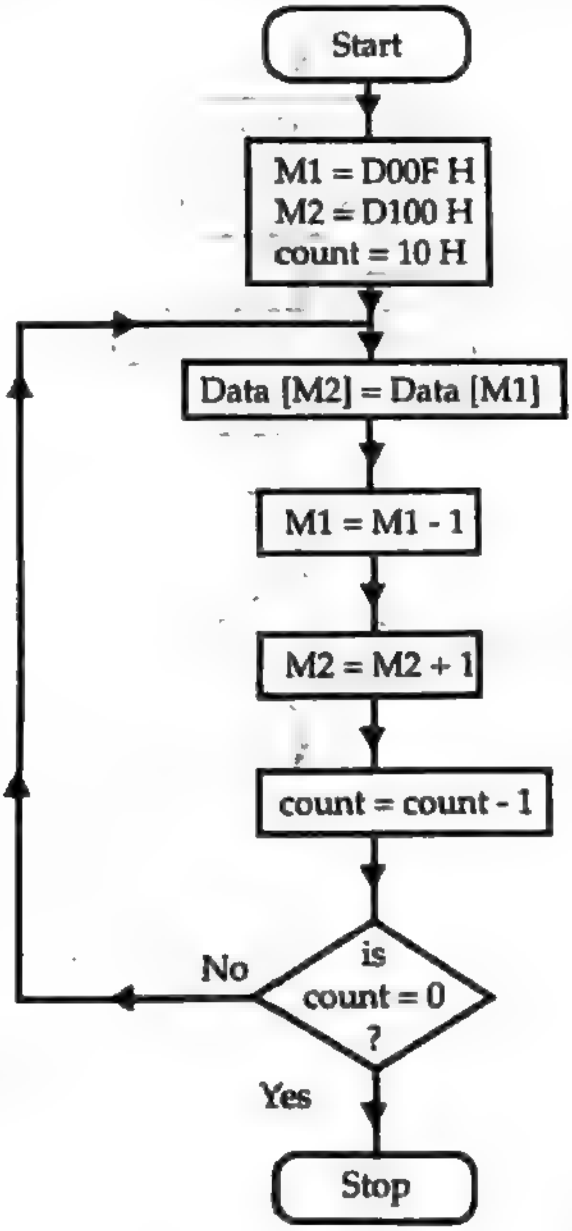


4) **A block of data is stored in memory from D000H to D00F H. Write a program to shift the data contents of the block in reverse order, starting from memory location D100H.**

Assembly language program :

Memory address	Label	Mnemonics	Comments
C000		LXI H, D00F H	; set up HL as a pointer to source
C003		LXI D, D100 H	; set up DE as a pointer to destination
C006		MVI B, 10 H	; set up B to count 16 bytes
C008	Loop	MOV A, M	; get data byte from memory
C009		STAX D	; Store data byte at destination
C00A		DCX H	; Decrement source pointer
C00B		INX D	; Increment destination pointer
C00C		DCR B	; Decrement count
C00D		JNZ Loop	; if not zero, go back
		C010 HLT	; Stop

Flowchart :

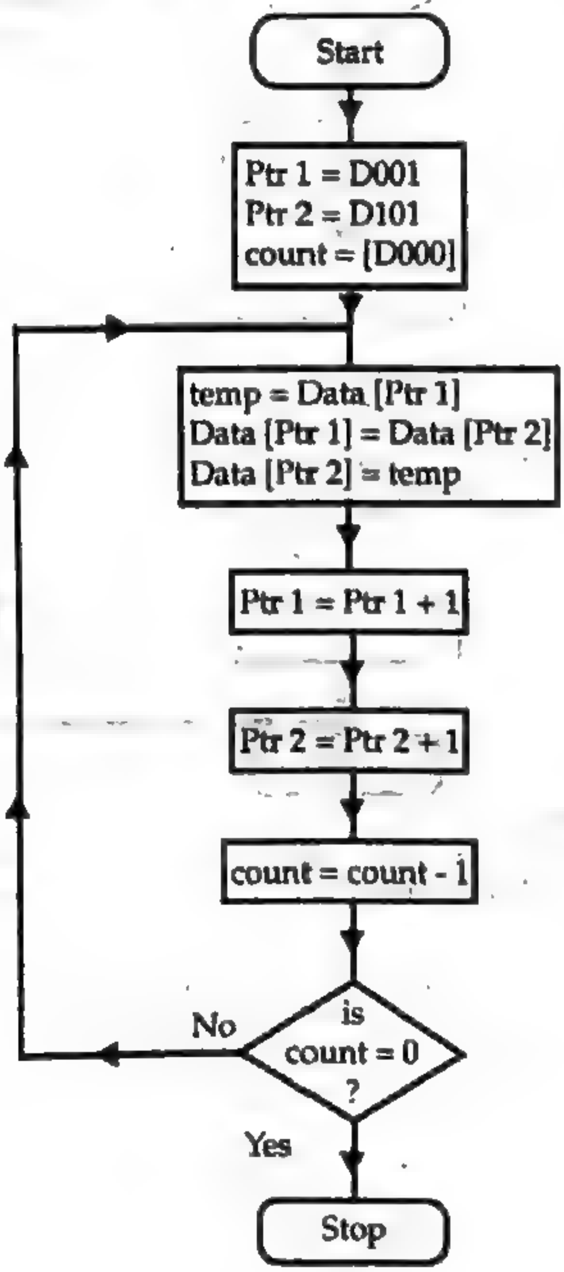


5) A block of data is stored in memory from D001H. The length of block is stored in D000H. Another block of same length is stored from D101H. Write a program in assembly language to exchange the contents of these two blocks. (March 2005)

Memory address	Label	Mnemonics	Comments
C000		LXI H, D000 H	; Set up HL as source memory
C003		LXI D, D101 H	; Setup DE as an index for destination
C006		MOV B, M	; Setup B to count = [D000]
C007	NEXT	INX H	; Pointer to next source location
C008		MOV C, M	; Get databyte from source memory

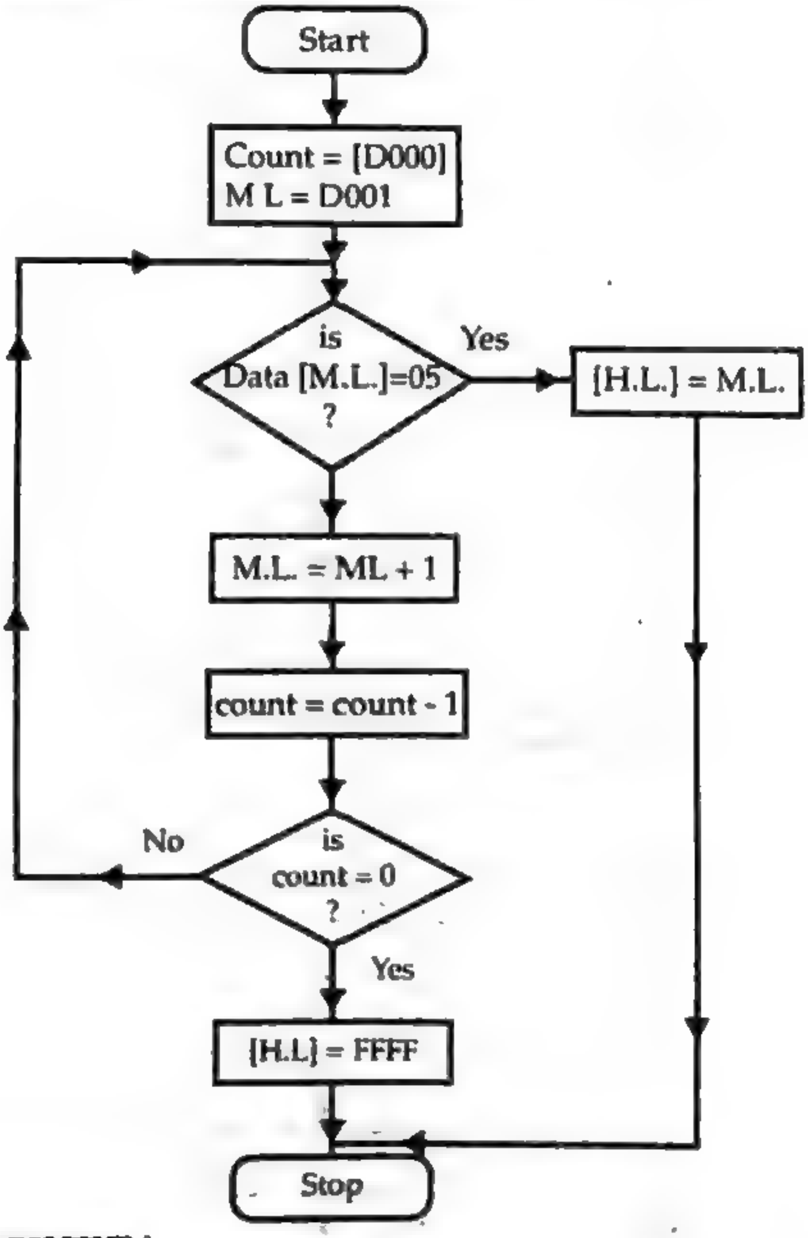
Memory address	Label	Mnemonics	Comments
C009		LDAX D	; Load databyte from destination in acc.
C00A		MOV M, A	; Store [A] in first block
C00B		MOV A, C	; Copy [C] into [A]
C00C		STAX D	; Store [A] at second block
C00D		INX D	; Pointer to next destination location
C00E		DCR B	; decrement count
C00F		JNZ NEXT	; Repeat the loop
C012		HLT	; Stop

Flowchart :



6) A block of data is stored in memory from D001. The length of block is stored in memory location D000H. Write a program that searches for first occurence of data 05 H in given block. Store the address of this occurence in H-L pair. If the number is not found, then H-L pair should contain FFFF H.

Flow chart :



Assembly language program :

Memory address	Label	Mnemonics	Comments
C000		LXI H, D000H	; Set H-L pair to D000H
C003		MOV C, M	; Set count = [D000]
C004		MVI A, 05H	; Set [Acc.] = 05 H
C006	Loop	INX H	; [H-L] = [H-L] + 1

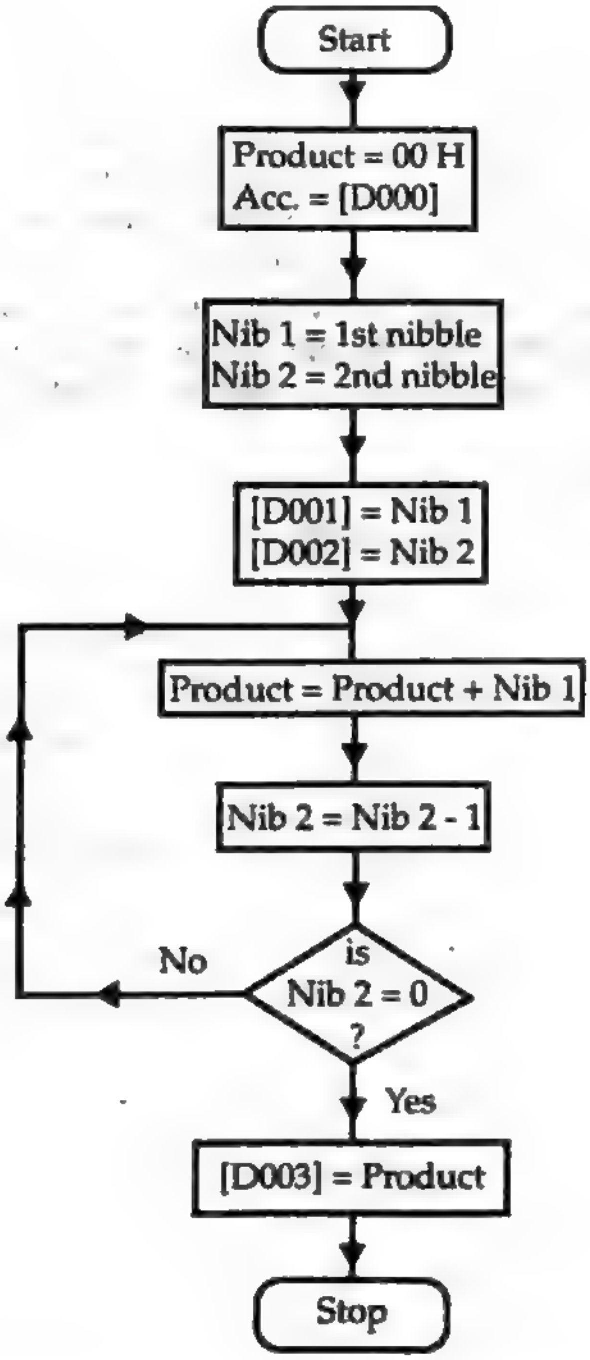
Memory address	Label	Mnemonics	Comments
C007		CMP M	; Is [M-L] = 05 ?
C008		JZ escape	; escape, if [M-L] = 05 H
C00B		DCR C	; count = count – 1
C00C		JNZ Loop	; repeat, if count ≠ 0
C00F		LXI H, FFFF H	; Set H-L pair to FFFF if number is not found
C012	escape	HLT	; Stop

7) Write an ALP that separates the two nibbles of an 8-bit hex number stored in memory location D000H. Store the same in memory locations D001 and D002H. The program must also multiply the two nibbles and store the product in memory location D003H.

Assembly language program : **March 2011**

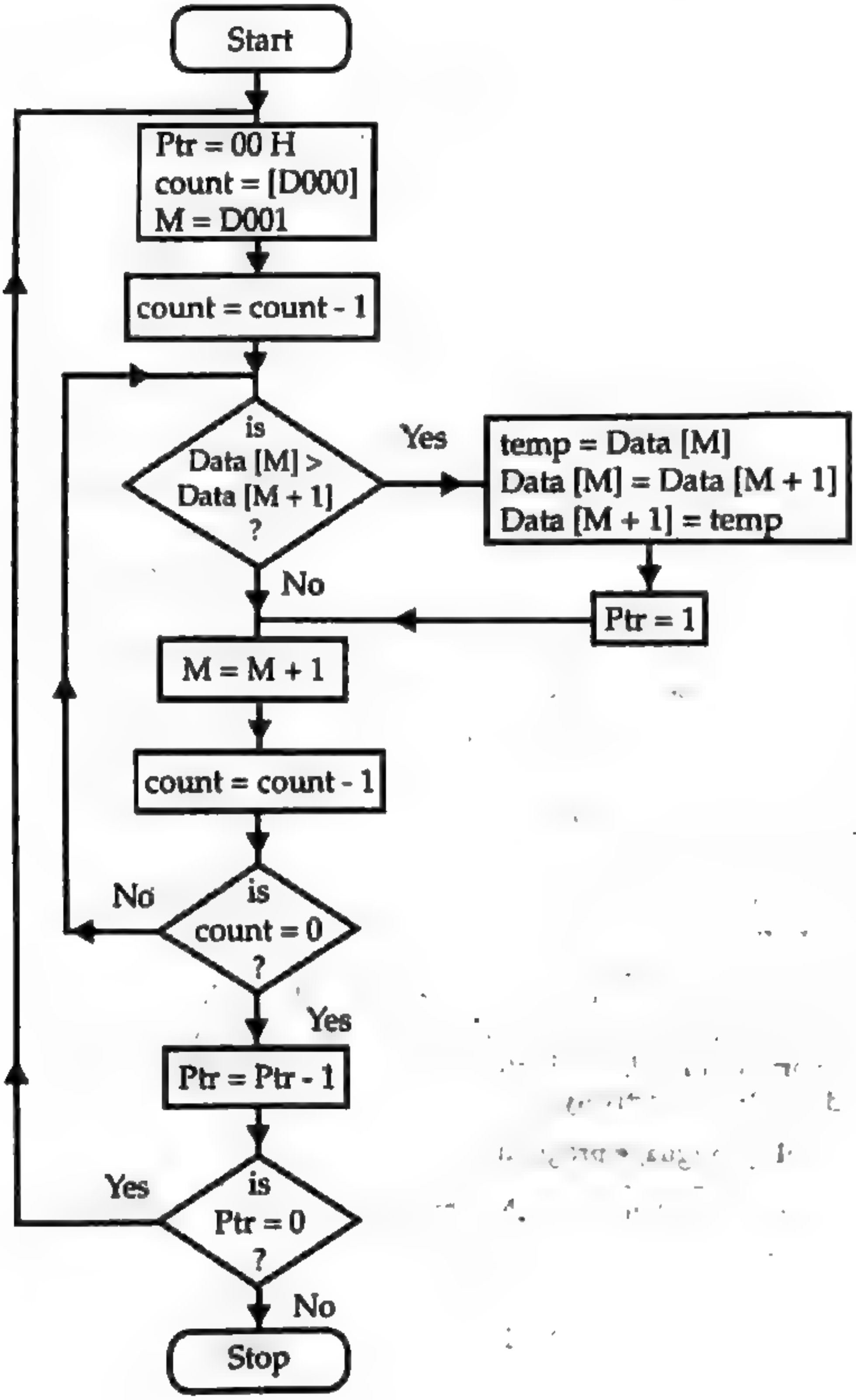
Memory address	Label	Mnemonics	Comments
C000		LXI H, D000H	;Set H-L pointer to D000H
C003		MOV A, M	; take no. in Acc.
C004		ANI 0F H	; separate the first nibble
C006		MOV B, A	
C007		MOV A, M	; Again take no. in Acc.
C008		ANI F0H	; separate 2nd nibble
C00A		RRC	; with four rotate
C00B		RRC	; instructions make
C00C		RRC	; 4 MSB bits to 4 LSBS
C00D		RRC	
C00E		MOV C, A	; store in register C
C00F		INX H	; store first nibble in D001H
C010		MOV M, B	
C011		INX H	; store second nibble in D002H
C012		MOV M, C	
C013		SUB A	; initial product = 0
C014	Loop	ADD B	; product = product + Nib 1
C015		DCR C	; Nib2 = Nib2 - 1
C016		JNZ Loop	; repeat if Nib2 ≠ 0
C019		INX H	; store product in D003 H
C01A		MOV M, A	
C01B		HLT	; Stop

Flowchart :



8) **A block of data is stored in memory starting from memory location D001H. The length of block is stored at memory location D000H. Write a program in assembly language to sort the content of block in ascending order.**

Flowchart :


Start
Ptr = 00 H
count = [D000]
M = D001
count = count - 1
is
Data [M] >
Data [M + 1]
?
Yes
temp = Data [M]
Data [M] = Data [M + 1]
Data [M + 1] = temp
No
Ptr = 1
M = M + 1
count = count - 1
No
is
count = 0
?
Yes
Ptr = Ptr - 1
Yes
is
Ptr = 0
?
No
Stop

Assembly language program :

Memory address	Label	Mnemonics	Comments
C000	Start	MVI B, 00H	; Set ptr = 00H initially
C002		LXI H, D000	; Set H-L pair to D000H
C005		MOV C, M	; Set count = [D000]
C006		INX H	; Increment HL reg pair by 1
C007		MOV A, M	; take first no. in acc.
C008		DCR C	; count = count – 1
C009	Loop	INX H	; [H-L] = [H-L] + 1
C00A		CMP M	; Is [Acc.] > [[H-L]] ?
C00B		JC escape	; Go to escape if [Acc.] < [(H-L)]
C00E		MOV D, M	; move mem content to reg. D
C00F		MOV M, A	;} Interchange two} number if [Acc.]
C010		DCX H	>[[H-L]]
C011		MOV M, D	; move reg. D content to mem
C012		INX H	; Increment HL reg pair by 1
C013		MVI B, 01H	; Set ptr = 01 H
C015	escape	DCR C	; count = count - 1
C016		JNZ Loop	; repeat if count ≠ 0
C019		DCR B	; ptr = ptr - 1
C01A		JZ Start	; go to start, if ptr = 0
C01D		HLT	; Stop

Note : For descending order, only the change is to use JNC escape in place of JC escape in above program.

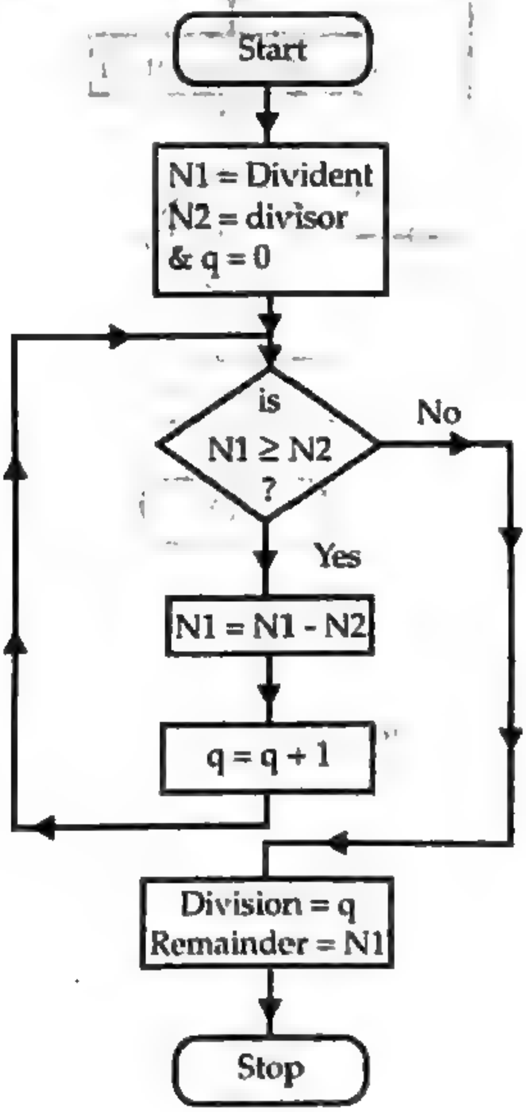
9) **Write an assembly language program that divides two one byte Hex numbers, where divident is stored in memory location D000H and divisor is stored in memory location D001H. Store quotient and reminder in memory locations D002H and D003H respectively.**

Assembly language program :

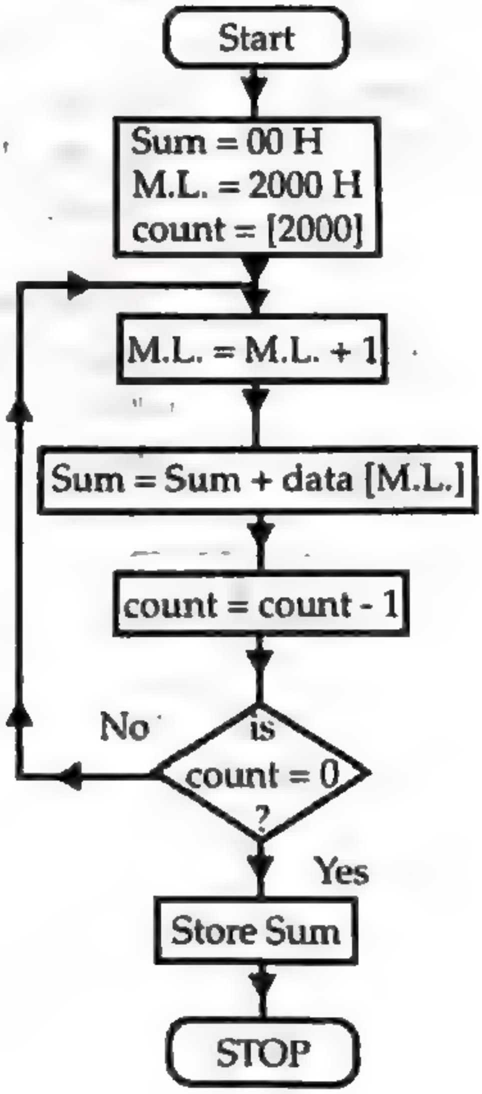
Memory address	Label	Mnemonics	Comments
C000		LXI HD000 H	; Set H-L pointer to dividend
C003		MVI C, 00H	; Set Initial quotient = 00
C005		MOV A, M	; Set Acc. = Divident
C006		INX H	; Set H-L pointer to divisor
C007	Loop	CMP M	; Is N1 ≥ N2 ?

Memory address	Label	Mnemonics	Comments
C008		JC Escape	; Go to Escape if N1 < N2
C00B		SUB M	; N1 = N1 - N2
C00C		INR C	; quotient = quotient + 1
C00D		JMP Loop	; jump to again compare N1 and N2
C010	Escape	INX H	; Increment HL reg pair by 1
C011		MOV M, C	; Store C reg content i.e. quotient in D002 H
C012		INX H	; Increment HL reg pair by 1
C013		MOV M, A	; Store acc content i.e. remainder in D003 H
C014		HLT	; Stop

Flowchart :



10) **A block of data is stored from location 2001H and onwards. The count is stored at location 2000H. Write an assembly language program to find out sum of the data items stored in block. Store the result at location 2500H and onwards starting with L.S.B.** (Mar. 02)



Assembly language program :

Memory address	Label	Mnemonics	Comments
C000		LXI H, 2000 H	; Set HL pointer to 2000H
C003		MOV C, M	; Get count in register C
C004		MVI A, 00H	; Make LSBs of sum = 00
C006		MOV B, A	; Make MSBs of sum = 00
C007	LOOP	INX H	; Set HL to point num in series
C008		ADD M	; Previous No. + Next No.

Memory address	Label	Mnemonics	Comments
C009		JNC AHEAD	; Is carry ? No, goto AHEAD
C00B		INR B	; Yes, add carry to MSBs of sum
C00C	AHEAD	DCR C	; Decrement count
C00D		JNZ LOOP	; Is count = 0 ? No, jump to loop
C010		STA 2500H	; Store LSBs of the sum to 2500 H
C013		MOV A, B	; Get MSBs of sum in accumulator
C014		STA 2501 H	; Store MSBs
C017		HLT	; Stop

11) **Write an assembly language program to add two 8 bit BCD numbers stored at memory locations 5000H and 5001H. Store the result at memory location 5002 H onwards starting with least significant bit.** (Mar. 02, Oct. 03)

Ans. :

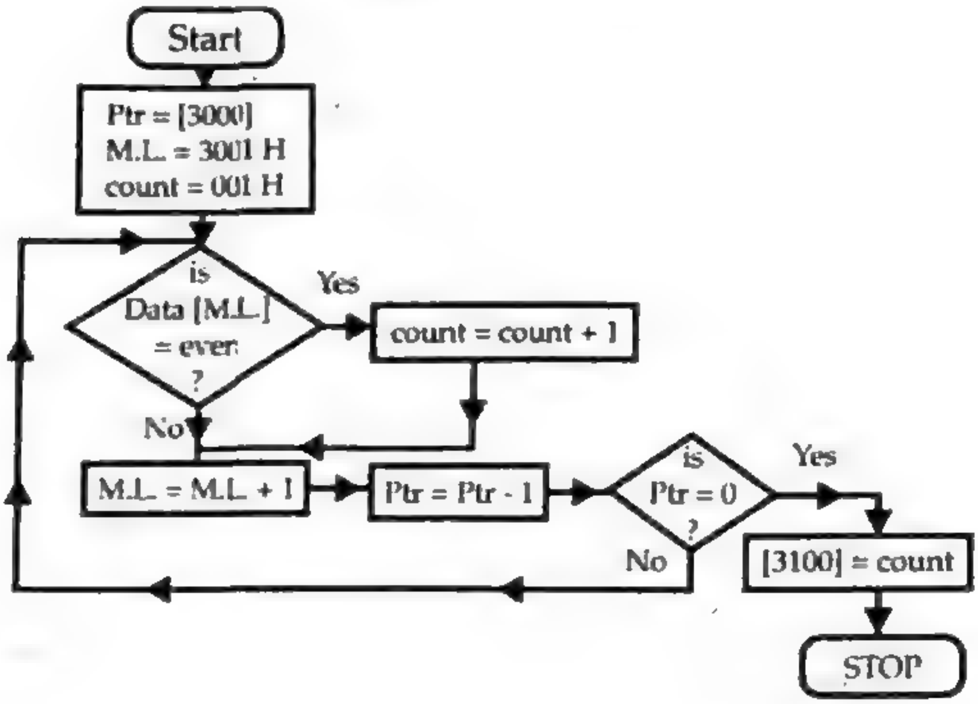
Memory address	Label	Mnemonics	Comments
C000		LXI H, 5000 H	; Initialize H-L pair with address of first number
C003		MVI C, 00H	; Initialize register C to store MSB.
C005		MOV A, M	; Get first number in accumulator.
C006		INX H	; Address of next number in H-L pair
C007		ADD M	; Add two numbers
C008		DAA	; Decimal adjust accumulator.
C009		JNC L1	; Jump if no carry to label L1
C00C		INR C	; If carry, increment MSB in register C.
C00D	L1	STA 5002H	; Store the LSB of SUM in location 5002H
C010		MOV A, C	; Get MSB in accumulator
C011		STA 5003H	; Store the MSB of SUM in location 5003H
C014		HLT	; Stop the processing

12) **Write an assembly language program to count number of even data bytes occurring in a block stored from memory location 3001H and onwards. The length of block is stored in location 3000H. Store the result in location 3100H.** (Mar. 02)

Assembly language program :

Memory address	Label	Mnemonics	Comments
C000		LXI H, 3000 H	; Initialize HL pointer to 3000H
C003		MVI B, 00H	; Initialize register B to store count
C005		MOV C, M	; Get length of block in C
C006	Loop	INX H	; Increment H-L pair by 1
C007		MOV A, M	; Get number in accumulator
C008		RRC	; Check even number
C009		JC AHEAD	; Jump on carry i.e. if no. is odd
C00C		INR B	; No carry - increment count
C00D	AHEAD	DCR C	; Decrement C by 1
C00E		JNZ Loop	; Is zero ? No - jump to Loop
C011		MOV A, B	; Store count in accumulator
C012		STA 3100H	; Store result in 3100 H
C015		HLT	; Stop

Flowchart :



13) **A hex number is stored at location 3000 H. Write an assembly language program to interchange its digits. The new number is to be stored at 3001. Add original number with new number and store the result at location 3010 H.** **(March 2002, Oct. 2010)**

Algorithm :

Step 1 : Set : [Acc.] = [3000]

Step 2 : Repeat For I = 1 To 4

Rotate [Acc.] one bit right.

Step 3 : Set : [3001] := New no.

Step 4 : Sum = New no. + original no.

Step 5 : Set : [3002] = Sum

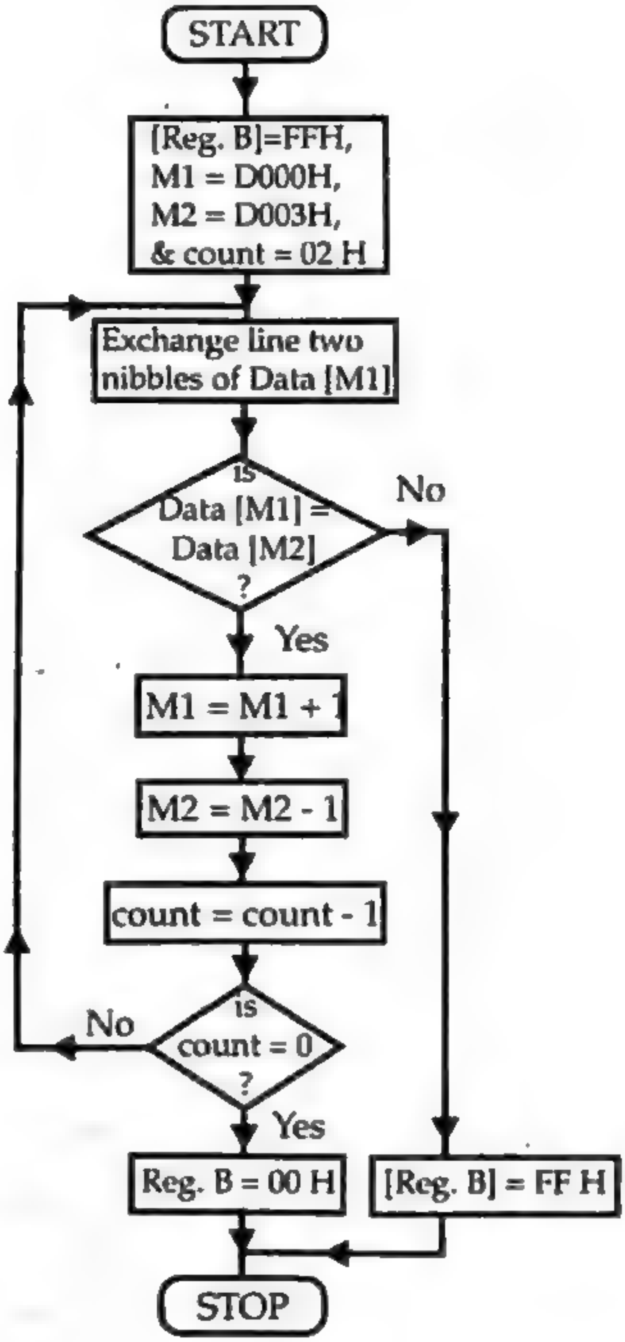
Step 6 : Exit.

Assembly language program :

Memory address	Label	Mnemonics	Comments
C000		LXI , 3000 H	; Set H-L pointer to 3000H
C003		MOV A, M	; take no. in accumulator
C004		RRC	; with 4 RRC instructions
C005		RRC	; Interchange the digits of the no
C006		RRC	
C007		RRC	
C008		INX H	Increment HL reg pair by 1
C009		MOV M, A	; store the exchanged no. in 3001 H
C00A		DCX H	; Decrement HL reg pair by 1
C00B		ADD M	; Add new no. & original no.
C00C		STA 3010H	; Store result in 3010H
C00F		HLT	; Stop

14) **A 4-byte hex number, beginning with lower order byte is stored from memory location D000H. Write an ALP that checks whether the given number is palindrome or not. If the number is palindrome, then register B contains 00H. Else, it contains FFH.**

Flowchart :



Assembly language program :

Memory address	Label	Mnemonics	Comments
C000		LXI H, D000 H	; Set H-L pair to D000H
C003		LXI D, D003H	; Set D-E pair to D003H
C006		MVI C, 02H	; Set count = 02H

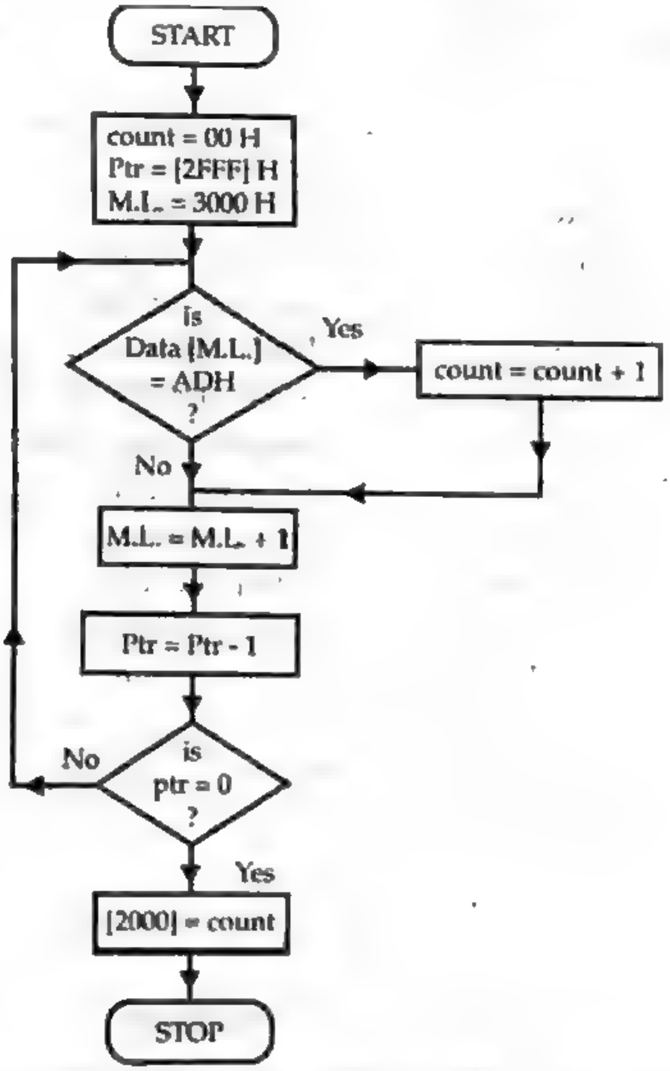
Memory address	Label	Mnemonics	Comments
C008	Loop	MOV A, M	; take [[H-L]] in accumulator
C009		RRC	; with 4 RRC
C01A		RRC	; exchange the
C00B		RRC	; two nibbles of
C00C		RRC	; no. in accumulator
C00D		XCHG	; Exchange [H-L] & [D-E]
C00E		CMP M	; is [Acc.] = [[H-L]] ?
C00F		JNZ Escape	; escape if [Acc.] ≠[[H-L]]
C012		XCHG	; Reexchange [HL] & [DE] pairs
C013		INX H	; [H-L] = [H-L] + 1
C014		DCX D	; [D-E] = [D-E] - 1
C015		DCR C	; count = count - 1
C016		JNZ Loop	; Repeatif count ≠ 0
C019		MVI B, 00H	; Set [Reg. B] = 00
C01B		JMP STP	if No. is palindrome.
C01E	Escape	MVI B, FFH	; Number is not palindrome
C020	STP	HLT	; stop

15) **Write an assembly language program to count the number of times the data ADH is found in a block of memory locations starting from 3000H. Length of block is stored in location 2FFFH. Store the result in location 2000H.** **(March 2002)**

Assembly language program :

Memory address	Label	Mnemonics	Comments
C000		MVI B 00H	; Set Count = 00 H
C002		LXI H, 2FFF H	; Set H-L pointer to 2FFF H
C005		MOV C, M	; Get count in register C
C006	Loop	INX H	; [H-L] = [H-L] + 1
C007		MOV A, M	; Check whether
C008		CPI ADH	; [[H-L]] = ADH or not.
C00A		JNZ NEXT	; If zero ? No-jump to NEXT
C00D		INR B	; count = count + 1
C00E	NEXT	DCR C	; Decrement count
C00F		JNZ Loop	; Repeat loop if count ≠ 0
C012		MOV A, B	; Yes, store count in A
C010		STA 2000	; Store count in 2000 H
C016		HLT	; Stop

Flowchart :



16) Write a program to complement each flag in the flag register.

Memory address	Label	Mnemonics	Comments
C000		PUSH PSW	; Save flags on stack
C001		POP H	; Retrieves flags in 'L'
C002		MOV A, L	; Flags in accumulator
C003		CMA	; Complement accumulator
C004		MOV L, A	; Accumulator in Reg 'L'
C005		PUSH H	; Save on stack
C006		POP PSW	; Back to flag register
C007		HLT	; Stop

17) Write a subroutine to fill the memory locations 2800H to 28FFH with Hex numbers 00H to FFH respectively.

Memory address	Label	Mnemonics	Comments
F000	START	LXI D, 2800 H	; Set memory start address
F003		XRA A	; Clear acc. and carry
F004		MVI B FFH	; load counter
F006	LOOP	STAX D	; Store data in memory
F007		INR A	; increment data
F008		INR E	; increment memory address
F009		DCR B	; count = count - 1
F00A		JNZ LOOP	; go back if not over
		F00D RET	; return to main program if over

18) **Trace the following program and fill in the blanks.**

MVI	**B, 08 H**		
MVI	**C, 03 H**		
MVI	**A, 01 H**	**Result :**	
ANI	**05 H**	**(i)**	**[Reg. A] = ...**
STA	**D000 H**	**(ii)**	**[Reg. B] = ...**
ADD	**C**	**(iii)**	**[Reg. C] = ...**
MOV D,	**C**	**(iv)**	**[Reg. D] = ...**
		(v)	**[D000] = ...**

Ans. : Given program is :

Mnemonics	Comments
MVI B, 08 H	: Set reg. B to immediate data 08 H i.e. [reg. B] = 08 H
MVI C, 03 H	: Set reg. C to immediate data 03 H i.e. [Reg. C] = 03 H
MVI A, 01 H	: Set accumulator to immediate data 01 H i.e. [Acc.] = 01 H
ANI 05 H	: Logically AND data 05 H with [A] i.e. [A] : 0 0 0 0 0 0 0 1 AND 05 : 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 1 = 01 i.e. [A] = 01 H.
STA D000 H	: Move [Acc.] m. l. [D000] i.e. [D000] = 01 H.
ADD C	: Add [C] to [Acc.] and store result in Acc. [Acc.] = 01 H = 0 0 0 0 0 0 0 1 + [C] = 03 H = 0 0 0 0 0 0 1 1 0 0 0 0 0 1 0 0 i.e. [Acc.] = 04 H
MOV D, C	: Move contents of reg. C to reg. D i.e. [reg.D] = 03 H

Final Result :

(i) [Reg. A] = 04 H (ii) [Reg. B] = 08 H (iii) [Reg. C] = 03 H

(iv) [Reg. D] = 03 H (v) [D000] = 01 H

19) Write an assembly language program to copy a block of data having starting address 8900 H to the new location starting from 9100H. The length of block is stored at memory location 88FFH. **(October 2003)**

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI H 88FF H	; Initialize H-L pair with address of count
	LXI B, 9100 H	; Initialize B-C pair with starting address of destination block
	MOV D, M	; Copy the count in Register D.
	INX H	; H-L pair points to the starting address of source block.
LOOP	MOV A, M	; Transfer the memory content to accumulator.
	STAX B	; Store the accumulator content to new location.
	INX H	; Increment H-L pair
	INX B	; Increment B-C pair
	DCR D	; Decrement count
	JNZ LOOP	; Jump if no zero to label LOOP
	END HLT	; Stop processing.

Write an assembly language program to add two 8 bit BCD numbers stored at memory location 5000H and 5001H. Store the result at memory location 5002 H onwards starting with least significant bit. **(October 2003)**

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI H, 5000H	; Initialize H-L pair with address of first number
	MVI C, 00H	; Initialize register C to store MSB.
	MOV A, M	; Get first number in accumulator.
	INX H	; Address of next number in H-L pair
	ADD M	; Add two numbers.
	DAA	; Decimal Adjust accumulator
	JNC L1	; Jump if no carry to label L1
	INR C	; If carry increment MSB in register C.
L1	STA 5002H	; Store the LSB of SUM in location 5002 H
	MOV A, C	; Get MSB in accumulator
	STA 5003 H	; Store the MSB of SUM in location 5003 H
	END HLT	; Stop the processing

21) Write an assembly language program to find out 2's compliment of five numbers stored from memory location 3330H and onwards. Store the result from memory location address 4100H. **(Oct. 03)**

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI H, 3330H	; Initialize H-L pair with address of first number.
	LXI B, 4100H	; Initialize B-C pair with destination address.
	MVI D, 05H	; Store count in register D
LOOP	MOV A, M	; Get the number in accumulator
	CMA	; 1's complement of number in accumulator
	INR A	; 2's complement of number in accumulator.
	STAX B	; Store 2's complement at address pointed to by BC pair.
	INX H	; Increment H-L pair
	INX B	; Increment B-C pair
	DCR D	; Decrement count in register D
	JNZ LOOP	; Is count zero ? no-jump to lable LOOP
END	HLT	; Stop the processing

22) A block of data is stored in memory location from 9101H to 91FFH. Write an assembly language program to transfer the block in reverse order to memory location 9200H and onwards. **(Oct. 03, Oct. 2008; July 18)**

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI H, 91FF H	; Initialize H-L pair with address for last location of source block
	LXI B, 9200 H	; Initialize B-C pair with destination address.
	MOV D,L	; Get the count FFH in register D.
LOOP	MOV A,M	; Get the number in accumulator.
	STAX B	; Store the number at address pointed to by B-C pair.
	DCX H	; Decrement H-L pair
	INX B	; Increment B-C pair
	DCR D	; Decrement count
	JNZ LOOP	; Is count zero ? No - jump to label LOOP
END	HLT	; Stop processing.

23) Write an assembly language program to count the number of odd data byte occuring in a block starting from the memory location address 7501H to 75FFH Store the result at the memory location 7600H. (Mar. 2005, Oct. 20

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI H, 7501 H	; Initialize H-L pair with starting address
	MVI C, FFH	; Store count FFH in register C.
	MVI B, 00H	; Initialize odd count to zero in register B
LOOP	MOV A, M	; Get the number in accumulator
	RRC	; Rotate to determine odd or not ?
	JNC GO	; Is carry ? No-jump to label GO.
	INR B	; Yes - Increment odd count
GO	INX H	; Increment H-L pair
	DCR C	; Decrement count
	JNZ LOOP	; Is count zero ? No - jump to lable LOOP
	MOV A, B	; Get odd count in accumulator
	STA 7600 H	; Store odd count at 7600 H
END	HLT	; Stop processing.

24) Write an assembly language program to perform the multiplication of two 8-bit numbers where multiplicand is stored at the memory locations 2501H and 2502H and multiplier is stored at 2503H. The result is to be stored at memory location address 2504H and 2505H.

(Note : 8 bit multiplicand is extended to 16 bit) (Oct. 2

Ans. :

Label	Mnemonics+ Operand	Comments
START	LHLD 2501 H	; Get multicand in H-L pair
	XCHG	; Multicand in D-E pair
	LDA 2503 H	; Multiplier in accumulator
	LXI H, 0000H	; Initial value of product equal to 0000H in H-L pair
	MVI C, 08H	; Count is 8 in register C
LOOP	DAD H	; Shift partial product left by one bit
	RAL	; Rotate multiplier left by one bit.
	JNC GO	; Is multiplier bit = 1 ? NO - goto label GO
	DAD D	; Product = Product + Multicand
GO	DCR C	; Decrement count
	JNZ LOOP	; jump if no zero to label LOOP
	SHLD 2504 H	; store the result
END	HLT	; stop processing

25) **Write an assembly language program to divide a hexadecimal number stored in a memory location 8000 H by a hexadecimal number stored in memory location 8001 H. Store the quotient at 8002 H and remainder at 8003 H.** (March. 2004, Oct.2004)

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI H, 8000 H	; Initialize H-L pair with dividend address
	MVI C, 00H	; Initialize quotient to 00H in register C.
	MOV A, M	; Get the dividend in accumulator
	INX H	; Set H-L pointer to divisor.
LOOP	CMP M	; Is dividend ≤ divisor ?
	JC ESCAPE	; If yes, go to ESCAPE
	SUB M	; If no, subtract divisor from dividend
	INR C	; Increment quotient by 1
	JMP LOOP	; Jump to again LOOP
ESCAPE	INX H	; Increment H-L pair
	MOV M, C	; Store quotient in 8002 H
	INX H	; Increment H-L pair
	MOV M, A	; Store remainder in 8003 H
END	HLT	; Stop processing.

26) **An 8-bit number is stored in memory location C400H. Write an assembly language program to count the 'zero' in the given number. Store the count in memory location C500H.** (March.2004)

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI H, C400H	; Initialize H-L pair with address of number
	MOV B, M	; Get number in B register
	MVI C, 00H	; Initialize register C to store count of zeros.
	MVI E, 08H	; Initialize register E to store counter for 8-bit number.
Loop	MOV A, B	; Transfer the 8-bit number into accumulator
	RLC	; Rotate content of accumulator left side by one bit to check the bit.
	MOV B, A	; Store the rotated data in register B.
	JC DOWN	; If carry ? Yes, jump to DOWN
	INR C	; Increment register C contents by 1 if there is no carry means bit is zero
DOWN	DCRE	; Get answer i.e. number of zeros to accumulator
	JNZ Loop	; Jump if no zero to Loop
	MOV A, C	; Qet answer i.e number of zero's to acc.
	STA C500H	; Store the count in location C500H
END	HLT	; Stop the processing

27) **Write an assembly language program to transfer first 10 bytes of memory block starting from 5000 H to a new block starting from 5020 H.** (March.2004)

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI H, 5000H	; Initialize H-L pair with starting address of source block.
	LXI B, 5020 H	; Initialize B-C pair with starting address of destination block.
	MVI D, 0A H	; Initialize register D to store the count 0AH
LOOP	MOV A, M	; Transfer the memory content to accumulator
	STAX B	; Store the accumulator content to new location
	INX H	; Increment H-L pair
	INX B	; Increment B-C pair
	DCR D	; Decrement count
	JNZ LOOP	; Jump if no zero to label LOOP
END	HLT	; Stop the processing

28) **Write an assembly language program to generate the Fibbonacci's series for first eight numbers. Store the series in a memory block starting from C100H.**
(Note : The first hexanumbers of series are 00, 01, 01, 02, 03, 05, 08, 0D) (March.2004)

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI H, C100H	; Initialize H-L pair with starting address
	MVI D, 06 H	; Store count 06H in register D
	MVI B, 00H	; Initialize register B with first term of series i.e. 00H
	MOV M, B	; Copy the first term at memory
	INX H	; Increment H-L pair
	MVI C, 01H	; Initialize register C with second term of series 01 H
	MOV M, C	; Copy second term at memory
LOOP	INX H	; Increment H-L pair
	MOV A, B	; Get the number in accumulator
	ADD C	; Generate next term by adding previous two terms.
	MOV M, A	; Copy the result at memory location
	MOV B, C	; Copy the content of register C into B register
	MOV C, A	; Copy the content of accumulator into C register
	DCR D	; Decrement count
	JNZ LOOP	; Is count zero ? No-jump to label LOOP
END	HLT	; Stop processing

29) The two BCD numbers are stored at 3400H and 3401H. Write an assembly language program to add these BCD numbers and store the result in memory locations 3402 H and 3403 H. (March.04)

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI H, 3400 H	; Initialize H-L pair with address of first BCD number.
	MVI B, 00H	; Initialize register B to store MSB of first number
	MVI D, 00H	; Initialize register D to store MSB of second number
	MOV C, M	; Get first number into register C.
	INX H	; Increment H-L pair to point at second number.
	MOV E, M	; Get second number into register E.
	XCHG	; Exchange the contents of H-L pair with D-E pair
	DAD B	; Add first number with second number.
	XCHG	; Exchange the contents of H-L pair with D-E pair
	MOV A, E	; Transfer contents of register E to accumulator
	DAA	; Decimal adjust lower order byte of sum
	INX H	; Increment H-L pair
	MOV M, A	; Store lower order byte of sum to memory location 3402 H
	MOV A, D	; Transfer contents of register D to accumulator
	DAA	; Decimal adjust higher order byte of sum.
	INX H	; Increment H-L pair
	MOV M, A	; Store higher order byte of sum of 3403 H.
END	HLT	; Stop the processing

30) Write a assembly language program to count the occurrence of the data 9CH in a memory block starting from 4000H to 400FH. Store the count at memory location 4500H. (Mar. 2004)

Ans. :

Label	Mnemonics+ Operand	Comments
START	MVI C, 10 H	; Store count 10 H (16 bytes) in register C
	MVI B, 00H	; Initialize occurrence count in register B.
	LXI H, 4000H	; Initialize H-L pair with starting address
LOOP	MOV A, M	; Get the number in accumulator
	CPI 9CH	; Check whether the number in accumulator is 9CH
	JNZ NEXT	; If no ? jump to label NEXT
	INR B	; Yes, increment content in register B by 1.
NEXT	INX H	; Increment H-L pair
	DCR C	; Decrement count
	JNZ LOOP	; Is count zero ? No-jump to label LOOP
	MOV A, B	; Get count in accumulator
	STA 4500, H	; Store count of occurrence at 4500 H
END	HLT	; Stop processing

31) **Two three - byte numbers are stored in BCD and EHL registers. Write an assembly language program to find their sum and store the result in EHL.** (Oct.04)

Ans. :

Label	Mnemonics+ Operand	Comments
START	MOV A, L	; Get least significant byte in A
	ADD D	; Add with D without carry
	MOV L, A	; Result in L
	MOV A,H	; Get middle byte in A
	ADC C	; Add with carry
	MOV H, A	; Result in H.
	MOV A,E	; Get most significant byte in A
	ADC B	; Add with carry
	MOV E, A	; Result in E
	HLT	; stop processing

32) **Write an assembly language program to divide data at location 1050 by data stored at location 1051. Store the quotient and remainder in 1060 and 1061 memory locations respectively.**

Ans. : (Please . see similar Question 25 page No - 2 - 81 & Make Necessary changes) (Oct. 04)

33) **The length of block is in memory location 1070 and block itself begins from 1071. Write a program in assembly language to store the count of odd numbers in register C.** (Oct. 04)

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI H, 1070 H	; Initialize H-L pair with starting address
	MOV D, M	; Store length of block in D
	INX H	; Point to next memory location
	MVI C, 00H	; Initialize odd count to zero
LOOP	MOV A, M	; Get the number in accumulator
	RRC	; Rotate to determine odd or not ?
	JNC GO	; Is carry ? NO jump to label GO
	INR C	; Yes - Increment odd count
GO	INX H	; Increment H-L pair
	DCR D	; Decrement count
	JNZ LOOP	; Is count zero ? No-jump to label loop
	HLT	; stop processing

34) Write a program in assembly language to transfer a block of data from 1050 to 1059 to memory location whose starting address is 1070 using exchange (XCHG) instruction. (Oct. 2004)

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI H, 1050 H	; Initialize H-L pair with starting address
	LXI D, 1070 H	; Initialize D-E pair with destination address
	MOV C, 0AH	; Get count in register C
UP	MOV A, M	; Get number from memory to acc.
	XCHG	; Exchange the memory pointer (HL ↔ DE)
	MOV M, A	; Transfer the number at destination memory.
	XCHG	; Exchange memory pointer for original position
	INX H	; Increment memory pointer
	INX D	; Increment destination memory pointer
	DCR C	; Decrement count
	JNZ UP	; Is zero ? NO - jump to label UP
	HLT	; Stop processing

35) Write a program in assembly language to find the two's compliment of a sixteen bit number stored in memory location C000 and C001. Store the result in memory locations C002 and C003. (Oct. 2004)

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI H, C000H	; Point to LSBs of 16-bit number
	MVI B, 00H	; Move immediate 00H content to B reg.
	MOV A, M	; Get 8-LSBs in Accumulator
	CMA	; Take 1's complement of 8-LSBs of number
	ADI 01 H	; Add 01 for 2's complement
	STA C003 H	; Store the 8-LSBs result
	JNC GO	; Is carry ? No-jump to label GO
	INR B	; If carry then increment B by 1
GO	INX H	; Point to 8-MSBs of 16-bit number
	MOV A, M	; Get number in A
	CMA	; Take 1's complement of 8-MSBs
	ADD B	; If carry from 8-LSBS then add it to MSBs
	STA C004 H	; Store the 8-MSBs result
	HLT	; Stop processing

36) **Write an assembly language program to check validity of given code at location C020. A code is said to be valid, if count of high (logic 1) in first five MSB's reads two and remaining three bits read low.**

If code is valid, HL should read AAAA or else it should read FFFF. **(Oct. 2004)**

Ans. :

Label	Mnemonics+ Operand	Comments
START	MVI B, 00 H	; Set count = 00H
	MVI C, 05 H	; Set count = 05 H
	LXI H, C020 H	; Initialize H - L pair
	MOV A, M	; Get data into A
AGAIN	RLC	; Rotate contents of A left side
	JNC ZERO	; If bit is low then jump to ZERO
	INR B	; Increment count if bit is high
ZERO	DCR C	; Decrement count
	JNZ AGAIN	; Is zero ? No, jump to AGAIN
	MOV A, B	; Move high bit count to A
	CPI 02 H	; Check count is 2 or not
	JNZ END	; If no, then jump to END
	MOV A, M	; If yes, take original data to check
		; last three bits
	MVI C, 03 H	; Set count C = 03 H
UP	RRC	; Rotate contents of Acc right side
	JC END	; If bit is high then invalid data
	DCR C	; If low then decrement count
	JNZ UP	; Repeat until C ≠ 0
	LXI H, AAAA H	; Valid data so set HL with AAAA
	JMP STOP	; Goto Halt
END	LXI H, FFFF H	; Invalid data, set HL with FFFF
STOP	HLT	; Stop processing

37) **Write an assembly language program to count the number of times a data D5 H is found in a block of memory having starting address 3000 H. Length of the block is stored in 2FFF H. Store the result in memory location 2000 H.** **(March 2005)**

Ans. :

Label	Mnemonics+ Operand	Comments
START	MVI B, 00 H	; Set count = 00 H
	LXI H, 2FFFH	; Set HL pointer to 2FFF H
	MOV C, M	; Get count in register C
LOOP	INX H	; Increment H-L pair

Label	Mnemonics+ Operand	Comments
	MOV A, M	; Get number in accumulator
	CPI D5 H	; Check whether the number is D5 or not.
	JNZ NEXT	; If not zero ? Jump to NEXT
	INR B	; If found then increment count
NEXT	DCR C	; Decrement count
	JNZ LOOP	; Repeat Loop if count ≠ 0
	MOV A, B	; Store count in A
	STA 2000 H	; Store count in 2000 H
	HLT	; Stop processing

38) **Write an assembly language program to get a decimal sum of series of numbers whose length is stored in C000 H and series itself starts from C001 H. Store the result in C050 H and C051H.** (March. 2005)

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI H, C000H	; Set HL pointer to C000H
	MOV C, M	; Get count in register C
	MVI A, 00H	; Make LSBs of SUM = 00 H
	MOV B, A	; Make MSBs of SUM = 00 H
LOOP	INX H	; Set HL to point the number in series
	ADD M	; Previous no. + Next no.
	JNC AHEAD	; Is carry ? No goto AHEAD
	INR B	; Yes, add carry to MSBs of sum
AHEAD	DAA	; Adjust accumulator to decimal contents
	DCR C	; Decrement count
	JNZ LOOP	; Is count = 0 ? No, jump to LOOP
	STA C050 H	; Store LSBs of the sum to C050H
	MOV A, B	; Get MSBs of sum in accumulator
	STA C051 H	; Store MSBs
	HLT	; Stop processing

39) **Write a program in assembly language to find the smallest number from a serial of numbers, whose length is stored in C000 H and the series itself begins from C001 H. Store the result in memory location C050 H.** **(March 2005)**

Ans. :

Label	Mnemonics+ Operand	Comments
	START LXI H, C000H	; Set HL pointer to C000H
	MOV C, M	; Get count in C
	MVI A, FF H	; Set smallest = FF H
LOOP	INX H	; Point to number in series
	CMP M	; Compare with previous number Is it smaller ?
	JC AHEAD	; No, smaller is in accumulator. Goto AHEAD
	MOV A, M	; Yes, get smaller no. in accumulator
AHEAD	DCR C	; Decrement count
	JNZ LOOP	; Repeat if count □ 0
	STA C050H	; Store the result
	HLT	; Stop processing

40) **Write an assembly language program to separate two nibbles of an 8-bit number stored in memory location 1500H. Add these two nibbles and store the sum in memory at BABAH location.** **(October. 2005)**

Ans. :

Label	Mnemonics+ Operand	Comments
START	LDA 1500H	; Load operand in Accumulator
	MOV B, A	; Get the number in B register
	RRC	; With four rotate
	RRC	; instructions make
	RRC	; 4 MSBs bits to
	RRC	; 4 LSBs and vice-versa.
	ANI 0FH	; Mask off 4 MSB's
	MOV C, A	; Move contents of accumulator into C register
	MOV A, B	; Move contents of B register into accumulator
	ANI 0FH	; Mask off 4 MSB's
	ADD C	; Add contents of register C to accumulator
	STA BABAH	; Store result at BABAH
	HLT	; Stop program execution

41) Write an assembly language program to convert the given 8-bit number stored in memory location ABCDH into ASCII format and store the ASCII value at location ABCEH and ABCFH. **(October. 2005)**

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI H, ABCDH	; Address of given no. in HL
	LXI D, ABCEH	; Destination address
	MOV A, M	; Move given number in accumulator
	RRC	; With four rotate
	RRC	instruction make
	RRC	4 LSBs to 4 MSBs
	RRC	and vice-versa
	CALL CON	; Call conversion subroutine
	STAX D	; Store ASCII value of 4 MSB's
	INX D	; Increment DE pointer
	MOV A, M	; Get original number into accumulator
	CALL CON	; Call conversion subroutine
	STAX D	; Store ASCII value of 4 LSBs
	HLT	; Stop program execution
CON	ANI 0FH	; Mask off 4 MSBS
	CPI 0AH	; Compare accumulator with OA
	JC NEXT	; If carry ? Yes, Jump to NEXT
	ADI 07 H	; Add 07H to ACC
NEXT	ADI 30 H	; Add 30 H to accumulator if digit from 0 to 9
	RET	; Return

42) Write an assembly language program to check the validity of each number of the given series. The series is stored in memory location starting from ABCDH to ABDDH. A number is said to be valid if 4 LSB's are greater than 4 MSB's. If the number is valid, then store 11H on that location. Otherwise store 00H on the same location. **(October. 2005)**

Ans. :

Label	Mnemonics+ Operand	Comments
START	MVI B, 11H	; Store count in register B
	LXI H, ABCDH	; Set starting address of series in HL
BACK	MOV A, M	; Get num in accumulator
	RRC	; With four rotate
	RRC	instruction make
	RRC	4 LSB's to 4 MSB's
	RRC	and vice-versa
	ANI 0FH	; Mask off 4 MSB's
	MOV D, A	; Move ACC to D
	MOV A, M	; Move original number into accumulator
	ANI 0FH	; Mask off 4 MSB's
	CMP D	; Compare 4 LSB's with 4 MSB's
	JC NEXT	; If carry ? Invalid number Jump to NEXT
	MVI M, 11H	; Otherwise mark this location as valid
	JMP AHEAD	; Jump to AHEAD
NEXT	MVI M, 00H	; Mark this location as invalid
AHEAD	INX H	; Increment HL pointer
	DCR B	; Decrement counter
	JNZ BACK	; Jump if no zero to BACK
	HLT	; Stop program execution B

43) **Write an assembly language program to perform the addition of 06H data to accumulator if auxiliary carry flag is set. Store this sum in memory at BABAH.** **(Oct. 0**

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI SP, BBBFH	; Initialize stack pointer
	PUSH PSW	; Store contents of ACC and Flag register into stack
	POP H	; Retrieve the current contents of ACC and
		Flag and store in H and L
	MOV A, L	; Move content of L (flag register) to accumulator
	ANI 10 H	; AND immediate ACC to 10 H
	JZ AHEAD	; if zero ? Jump to AHEAD
	ADI 06 H	; AC flag set so add 06 to ACC.
AHEAD	STA BABAH	; Store the result
	HLT	; Stop program execution

44) A set of eight data bytes are stored in memory starting from ABCDH. Write an assembly language program to add two bytes at a time and store the sum in the same memory location, low order sum replacing the first byte and carry replacing second byte. If any pair does not generate a carry, the memory location of second byte should be cleared. **(October 2005)**

Ans. :

Label	Mnemonics+ Operand	Comments
START	MVI C, 04H	; Store count in register C
	LXI H, ABCDH	; Load HL pair with memory address ABCDH
LOOP	MOV A, M	; Move contents of memory to ACC
	INX H	; Increment memory pointer
	ADD M	; Add second byte with first byte
	DCX H	; Decrement memory pointer
	MOV M, A	; Replace the first byte by SUM
	INX H	; Increment memory pointer
	JC NEXT	; Jump if carry to NEXT
	MVI M, 00H	; Otherwise clear memory holding second byte
	JMP AHEAD	; Jump on AHEAD
NEXT	MVI M, 01H	; Store the carry at memory holding second byte
AHEAD	INX H	; Increment memory pointer
	DCR C	; Decrement counter
	JNZ LOOP	; Jump if not zero to LOOP
	HLT	; Stop program execution

45) Write a subroutine labelled 'FIND' to search the largest element from a given unsigned series stored in memory location from ABBAH to ABCDH. Store the largest element at ABCEH and its address in HL register pair. **(October, 2005)**

Ans. :

Label	Mnemonics+ Operand	Comments
FIND	LXI SP, 2000 H	; Initialize stack
	LXI H, ABBAH	; Load HL pair with ABBA H
	MVI A, 00H	; Clear ACC
	MVI C, 14H	; Store count in register C
AGAIN	CMP M	; Compare ACC with memory
	JNC NEXT	; Is No carry ? Jump to NEXT
	MOV A, M	; Otherwise take larger number from memory to ACC
	PUSH H	; Store the address of larger number in stack
NEXT	INX H	; Increment memory pointer
	DCR C	; Decrement counter
	JNZ AGAIN	; Jump if no zero to AGAIN
	STA ABCEH	; Store larger number in memory
	POP H	; Retrieve and hold address of larger number in HL
	RET	; Return

46) Write an assembly language program to add all even numbers stored in a memory block of 10 locations starting from 2000H, store the two byte sum at memory location starting from 3000H. **(March 2006)**

Ans. :

Label	Mnemonics+ Operand	Comments
START	MVI C, 0AH	; Initialize counter
	LXI H, 2000H	; Initialize pointer
	MVI E, 00H	; Sumlow = 0
	MOV D, E	; Sumhigh = 0
BACK	MOV A, M	; Get the number in accumulator
	ANI 01 H	; Mask bit 1 to bit 7
	JNZ SKIP	; Don't add if number if ODD
	MOV A, E	; Get the lower byte of SUM
	ADD M	; SUM = SUM + data
	MOV E, A	; Store result in E register
	JNC SKIP	; If no carry ? Go to SKIP
	INR D	; Add carry to MSB of SUM
SKIP	INX H	; Increment pointer
	DCR C	; Decrement counter
	JNZ BACK	; Check if counter ≠ 0 repeat
	MOV A, E	; Get LSBs in ACC
	STA 3000 H	; Store lower byte
	MOV A, D	; Get MSBs in ACC.
	STA 3001 H	; Store higher byte
	HLT	; Terminate program execution

47) Write a program to set the sign and zero flag bits of the flag register to '1' and reset to '0' the remaining flag bits. The content of accumulator should be AAH. Also the content of BC, DE and HL register pair should be same as that of PSW. **(March 2006)**

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI SP, 2000 H	; Set stack pointer
	PUSH PSW	; Save flags on stack
	POP H	; Retrieves flags in L register
	MVI A, AAH	; Get contents in ACC
	ANI 80 H	; Set sign and zero flag and reset remaining flag bits.
	MOV L, A	; Transfer ACC to L register

Label	Mnemonics+ Operand	Comments
	PUSH H	; Save flags on stack
	POP PSW	; Retrieves flag in flag resister.
	MOV B, H	; Transfer PSW contents
	MOV C, L	into B and D register pair
	MOV D, H	
	MOV E, L	
	HLT	Stop processing

48) **Write an assembly language program to fill up the memory block of 20 memory locations starting from 2000H, with data bytes 00H and FFH at every alternate memory locations.** (March. 2006)

Ans. :

Label	Mnemonics+ Operand	Comments
START	MVI C, 13 H	; Initialize counter
	MVI D, 00H	; Move 00 to D register
	MVI E, FFH	; Move FF to E register
	LXI H, 2000H	; Initialize pointer
UP	MOV M, D	; Fill 00 in memory location
	DCR C	; Decrement count
	INX H	; Increment pointer
	MOV M, E	; Fill FF to next memory location
	INX H	; Increment pointer
	DCR C	; Decrement count
	JNZ UP	; Check if counter ≠ 0 repeat
	HLT	; Stop processing

OR

Label	Mnemonics+ Operand	Comments
START	MVI C, 13 H	; Initialize counter
	LXI H, 2000H	; Initialize pointer
UP	MOV A, L	; Get contents of register L in ACC
	ANI 01 H	; mask bit 1 to bit 7
	JNZ ODD	; Jump if odd memory location num.
	MVI M, 00 H	; Fill 00 H in memory
	JMP LOOP	; Goto Loop
ODD	MVI M, FF	; Fill FFH in memory.
LOOP	INX H	; Increment pointer
	DCR C	; Decrement counter
	JNZ UP	; Check if counter ≠ 0 repeat
	HLT	; Stop processing

49) A three byte number is stored in a memory with starting address 2000H. Write a program to check whether it is palindrome or not. If it is palindrome, then store 00H in register B else store FFH. (March. 2006)

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI H, 2000 H	; Initialize pointer
	LXI D, 2002H	; Initialize DE pair
	MOV A, M	; Get first byte of number
	RRC	
	RRC	; With 4 rotate
	RRC	instruction exchange
	RRC	the two nibbles of number
	XCHG	; Exchange contents of HL and DE
	CMP M	; Check if first and last byte of number is same or not
	JNZ ESCAPE	; If not same, go to ESCAPE
	XCHG	; Reexchange contents of HL and DE
	INX H	; Point to next byte
	MOV A, M	; Get middle byte of number in ACC
	ANI 0F	; Mask off 4 MSBs
	MOV C, A	; Store into C register
	MOV A, M	; Get original number
	RRC	
	RRC	; With 4 rotate instruction exchange
	RRC	two nibbles of number
	RRC	
	ANI 0F	; Mask off 4 MSBs
	CMP C	; Check two nibbles of number
	JNZ ESCAPE	; If not same goto ESCAPE
	MVI B, 00H	; Set 00 into B register if number is palindrome.
	JMP STEP	; Jump unconditionally to STEP.
ESCAPE	MVI B, FFH	; Set FFH into B register if number is not palindrome
STEP	HLT	; Stop processing

50) A BCD number is stored at memory location 2000H. Write an assembly language program to convert it into hexadecimal number and store it is the next memory location. (March. 200

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI H, 2000 H	; Initialize pointer
	MOV A, M	; Get BCD number
	ANI 0FH	; Mask most significant four bits
	MOV C, A	; Save uppacked BCD1 in C
	MOV A, M	; Get BCD again
	ANI F0H	; Mask least significant four bits
	RRC	; With 4 rotate instruction
	RRC	convert most
	RRC	significant four bits into
	RRC	unpacked BCD2
	MOV D, A	; Save BCD2 in D
	XRA A	; Clear accumulator
	MVI E, 0AH	; Set E as multiplier of 10
SUM	ADD E	; Add 10 until [D] = 0
	DCR D	; Reduce BCD2 by one
	JNZ SUM	; Is multiplication complete ? If not go back and add again
	ADD C	; Add BCD1
	INX H	; Increment pointer
	MOV M, A	; Store HEX number
	HLT	; Stop processing

Hint : Converting 2-digit BCD number into its equivalent Hex number following steps are requires:

(1) Separate an 8-bit packed BCD number into two 4-bit unpacked BCD digits. BCD 1 and BCD 2.

(2) Convert each digit into its binary equivalent according to its position.

(3) Add both numbers to obtain the Hex equivalent of the BCD number.

For e.g. Convert $(72)_{BCD}$ into Hex equivalent

$$72_{10} = 0111\ 0010_{BCD}$$

Step 1 : 0111 0010 $\rightarrow$ 0000 0010 Unpacked BCD 1

$\rightarrow$ 0000 0111 Unpacked BCD 2

Step 2 : Multiply BCD 2 by 10 (7×10)

Step 3 : Add BCD 1 to answer in step 2.

51) Write an assembly language program to add all odd numbers stored in memory block of 10 locations starting from 2000 H. Store the two byte sum at memory locations starting from 3000H. **(October. 2006)**

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI D, 0000H	; Initialize sum
	MVI C, 0AH	; Initialize counter
	LXI H, 2000H	; Initialize pointer
NEXT	MOV A, M	; Get the number in accumulator
	RRC	; Check LSB
	JNC SKIP	; Don't add if number is even
	MOV A, E	; Get the lower byte of sum
	ADD M	; SUM = SUM + data
	JNC SKIP1	; If no carry ? Go to SKIP1
	INR D	; Add carry to MSB of sum
SKIP1	MOV E, A	; Store result in E register
SKIP	INX H	; Increment pointer
	DCR C	; Decrement counter
	JNZ NEXT	; Check if counter ≠ 0 repeat
	XCHG	; Get sum in HL
	SHLD 3000H	; Store sum
	HLT	; Terminate program execution

52) Write an assembly language program to find the sum of first 10 numbers of the series 2^0, 2^1, 2^2, 2^3, ... Store the two byte result at memory locations starting from address 2000 H. **(Oct. 2006)**

Ans. :

Label	Mnemonics+ Operand	Comments
START	MVI C, 0AH	; Initialize counter
	LXI H, 0000H	; Initialize sum
	LXI D, 0001H	; Initialize first term i.e. 20 = 1
NEXT	DAD D	; Add sum term
	XCHG	; Exchange data
	DAD H	; Calculate next term
	XCHG	; Exchange data
	DCR C	; Decrement count
	JNZ NEXT	; If counter ≠ 0, repeat
	SHLD 2000H	; Store result
	HLT	; Stop

53) Write an assembly language program to find the occurrence of numbers divisible by 4 in a memory block of 10 locations starting from 2000 H. Store the count of occurrence at the end of block. **(October.2006)**

Ans. :

Label	Mnemonics+ Operand	Comments
START	MVI B, 00H	; Initialize count
	MVI C, 0AH	; Initialize counter
	LXI H, 2000H	; Initialize pointer
NEXT	MOV A, M	; Get number in accumulator
	RRC	; Check LSB
	JC SKIP	; Don't count if no. is not divisible by 4
	RRC	; Check second LSB
	JC SKIP	; Don't count if no. is not divisible by 4
	INR B	; Increment count if no. is divisible by 4
SKIP	INX H	; Increment pointer
	DCR C	; Decrement counter
	JNZ NEXT	; Repeat if counter ≠ 0
	MOV M, B	; Store result at end of block
	HLT	; Terminate process

54) **Write an assembly language program to generate the first ten numbers of Fibonacci series and store them in a memory block starting from 2000 H.** **(October. 2006)**

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI H, 2000H	; Initialize pointer
	MVI D, 08H	; Initialize counter
	LXI B, 0100H	; Initialize B = 01 and C = 00
	MOV M, C	; Copy first term at memory
	INX H	; Increment HL pair
	MOV M, B	; Copy second term at memory
NEXT :	INX H	; Increment HL pair
	MOV A, C	; Get previous term in accumulator
	ADD B	; Generate next term by adding ; previous two terms
	MOV M, A	; Copy result at memory
	MOV C, B	; Copy B to C
	MOV B, A	; Copy new term to B register
	DCR D	; Decrement counter
	JNZ NEXT	; Repeat if counter ≠ 0
	HLT	; Stop processing

55) **An ASCII code for a hexa-decimal digit is stored at memory location 2000 H. Write an assembly language program to convert it into hexa-decimal number and store it at 3000 H.** **(October. 2006; July 18)**

Ans. :

Label	Mnemonics+ operand	Comments
	LDA 2000	; Get ASCII code in accumulator
	SUI 40H	; Subtract 40H from acc
	JM NUM	; If code < 40, goto NUM
	ADI 09H	; If code > 40, add 09 to acc
	JMP OUT	; Jump at OUT
NUM	ADI 0AH	; Add OA if code < 40
OUT	STA 3000H	; Store result
	HLT	; Stop processing

;) **Write an assembly language program to count the number of 1's and 0's in a 8 bit binary number stored at memory location 2000 H. Store the counts for 0's and 1's in a memory location 2001 H and 2002 H respectively.** **(October. 2006)**

ns. :

Label	Mnemonics+ operand	Comments
START	LXI H, 0000H	; Clear H-L pair
	LDA 2000H	; Get number in accumulator
	MOV C, 08	; Initialize counter
NEXT	RRC	; Rotate acc to check a bit
	JNC SKIP	; If bit is zero, goto SKIP
	INR L	; Increment count since bit is 1
SKIP	DCR C	; Decrement counter
	JNZ NEXT	; Repeat if counter □ 0
	MVI A, 08	; Initialize acc
	SUB L	; Subtract count of 1 bit
	MOV H, A	; Take count of num of O bit
	SHLD 2001H	; Store result
	HLT	; Stop processing

57) **Write an assembly language program to shift 16-bit number by three bit left, stored in memory location starting from BABAH with LSB. Store the result startin from BADAH.** **(March 2007)**

Ans:

Label	Mnemonics+ operand	Comments
START	LHLD BABAH	; Load 16-bit number in HL register pair
	DAD H	; Double add
	JNC AHEAD	; Jump, if no carry AHEAD
	INR L	; if carry, increment lower byte by one
AHEAD	DAD H	; Double add
	JNC NEXT	; Jump, if no carry to NEXT
	INR L	; If carry, increment lower byte by one
NEXT	DAD H	; Double add
	JNC FORWARD	; Jump, if no carry to 'FORWARD",
	INRL	; If carry, increment lower byte by-one
FORWARD	SHLD BADAH	; Store result
	HLT	; Stop program execution

58) **Write an assembly language program to sort 25 numbers in-ascending order stored in memory location from AB01H and onward. Store the sorted data in memory from BC01H and onward.** **(March. 2007)**

Ans :

Label	Mnemonics+ operand	Comments
START	LXI H, AB01H	; Load HL pair with AB01H .
	MVI C,19H	; Initialize Count
	LXI D,BC01H	; load DE pair with BCO1H
	BACK MOV A, M	; Move memory to Acc.
	STAX D	; Store Acc. indirect
	INX H	; Increment HL pair pointer
	INX D	; Increment DE pair pointer
	DCR C	; Decrement Count
	JNZ BACK	; Jump, if no zero to BACK .
	MVI B,19H	; Move immediate 19H in reg. B
UP2	LXI H,BC01H	; Load HL pair with BC01 H
	MVI C,19H	; Move imm. 19H in reg. C
UP1	MOV A, M	; Move memory to Acc.
	INX H	; Increment HL pair pointer
	CMP M	; Compare Acc. with memory
	JC DOWN	; Jump on carry to DOWN
	MOV D, M	; Move memory to reg. D
	MOV M, A	; Move Acc., to memory
	DCX H	; Decrement HL pair pointer
	MOV M, D	; Move reg. D to memory
	INX H	; Increment HL pair pointer
DOWN	DCR C	; Decrement Count
	JNZ UP1	; Jump, if no zero to UP1
	DCR B	; Decrement reg. B by one
	JNZ UP2	; Jump, if no zero to UP 2
	HLT	; Stop program execution

59) **Write an assembly language program to fill the memory location starting from ABOOH and onward with decimal number from 0 to 99.** **(March. 2007)**

Ans :

Label	Mnemonics+ operand	Comments
START	LXI H, AB00H	; Load HL pair with ABOOH .
	MVI B,64H	; Store memory Block count in B
	SUB A	; Clear accumulator I
BACK	MOV M, A	; Move accumulator to memory
	ADI 01H	; Add 01 to accumulator
	DAA	; Decimal adjust accumulator
	INX H	; Increment HL memory pointer
	DCR B	; Decrement counter by one
	JNZ BACK	; Jump, if no zero to BACK
	HLT	; Stop process

60) **Write an assembly language program to find greatest and smallest from a given series stored in memory location from BABAH to BADAH Store the smallest number at BADBH and greatest number at BADCH.** **(March. 2007)**

Ans :

Label	Mnemonics+ operand	Comments
START	LXI H, BABAH	; Load HL pair immediate with BABAH
	MVI B, 21H	; Move counter in B
	DCR B	; Decrement counter
	MOV A, M	; Move memory to Acc
	MOV D, A	; Move Acc to D
	MOV E, A	; Move Acc to E
BACK	INX H	; Increment HL pair pointer
	CMP M	; Compare memory with Acc
	JC LARGE	; Jump, if carry to LARGE
	MOV D, A	; Otherwise move A to D
	MOV A, M	; Move memory to Acc.
	CMP E	; Compare E with Acc
	JNC SMALL	; Jump, if no carry to SMALL
	MOV E, A	; Move Acc to E
SMALL	MOV A, D	; Move D to Acc
	JMP XI	; Jump to XI
LARGE	MOV A, M	; Move memory to Acc.
XI	DCR B	; Decrement B
	JNZ BACK	; Jump, if no zero to BACK
	STA BADCH	; Store Acc at BADCH
	MOV A, E	; Move E to A
	STA BADBH	; Store Acc at BADB
	HIT	; Stop execution

61) Write an assembly language program to add two 8-bit numbers stored in memory location ABCDH and ABCEH. Store the sum in memory at ABDDH and the flag status at location ABDCH. (March. 2007)

Ans :

Label	Mnemonics+ operand	Comments
START	LXI SP 2000H	; Initialize stack pointer
	LHLD ABCDH	; Load numbers in H and L
	MOV A, H	; Move one operand to Ace
	ADD L	; Add second operand
	PUSH PSW	; Push PSW to stack
	POP H	; Retrieve result in HL
SHLD	ABDCH	; Store result
	HLT	; Stop process

62) Squares of decimal numbers from 0 to 9 are stored in memory from 1500H to 1509H respectively. Write an assembly language program to find the square of a given decimal number by look up table method given in the above range and is stored at 14F2H. Store the square of given number in memory at 14F3H. (March. 2007)

Ans :

Label	Mnemonics+ operand	Comments
START	LDA 14F2H	; Load Acc direct from memory
	MOV L, A,	; Move A to L
	MVI H, 15 H	; Move immediate I5 H to H
	MOV A, M	; Move memory to Acc.
	STA 14F3H	; Store result
	HLT	; Stop process

63) Write an assembly language program to count number of odd data bytes in the block of memory starting from 1300H to 13FFH and output on port 11H. (October. 2007)

Ans :

Label	Mnemonics+ operand	Comments
START	STC	; Set carry
	CMC	; Clear carry
	LXI H, 1300 H	; 1300 H Set HL pointer to 1300 H
	MVI B, FFH	; FFH Set location counter to FFH
	MVI C, 00H	; Set odd bytes counter to 00H
Again	MOV A, M	; get data from memory
	RAR	; Rotate acc. Right through carry
	JNC Skip	; Skip check odd or even
	INR C	; if odd byte counter increments

Label	Mnemonics+ operand	Comments
Skip	INX H	; increments memory pointer
	DCR B	; Decrement B reg content by 1
	JNZ Again	; checks if 255 bytes are checked
	MOV A, M	; Loads 256th byte if 255 bytes are checked
	RAR	; Rotate acc. Right through carry
	JNC Next	; Checks odd or even
	INR C	; if odd, increment odd
Next	MOV A, C	; byte counter & copies it to
	OUT 11H	; accumulator which is then output to output port 11H.
END	HLT	; Stop processing

64) Write a program segment using appropriate 'Rotate' instruction to divide the number in BC register pair by 2. The quotient should remain in BC register pair.
(October. 2007

Ans :

Label	Mnemonics+ operand	Comments
START	STC	; Set carry
	CMC	; complement the carry set carry to 0
	MOV A, B	; Carry MsBs to acc
	RRC	; Carry to MSB & LSB of higher order.
	MOV B, A	; Carry LSBs to acc
	RRC	; Rotate acc to right by 1
	MOV B	; move acc content to B reg.
END	HLT	stop processing

65) Write an assembly language program to count how many times 05H comes in a memory block starting at 4000H to 4004H. Store the result at 4070H. (October. 2007

Ans :

Label	Mnemonics+ operand	Comments
	LXI H, 4000 H	; Load the HL pair at 4000
	MVI C, 00 H	; clear the C Reg. for counter
	MVI D, 05 H	; store the total No. 05 in D register.
	MVI. A, 05 H	; Store no. 05 in A reg.
Start	MOV B, M	; Transfer the contents of memory to B register.
	SUB B	; Subtract the value of B reg. from A.
	JNZ loop	; If A # 0 then go to Loop
	INR C	; Otherwise increment the counter by 1.

Label	Mnemonics+ operand	Comments
LOOP	DCR D	; Decrement the D reg. by 1
	JZ end	; if D = 0 then go to end.
	INX H	; Increment the HL pair by 1.
	JMP Start	; Again go to start.
	MOV A, C	; Transfer content of reg. C to acc.
	STA 4070 H	; Store result at 4070 H.
END	RST 1	; stop processing.

66) **Write a program segment to find the largest number in a series. The length of the series is stored at 2500H and the numbers are stored from 2501H. Store the result at 2405H.** (Oct. 2007)

Ans :

Label	Mnemonics+ operand	Comments
START	LXI H, 2500 H	; address for count
	MOV C, M	; count in reg. C
	SUB A	; clear accumulator
LOOP	INX H	; Address of next memory
	CMP M	; compare with previous no is it greater ?
	JNC AHEAD No	; No larger is in ACC go to AHEAD.
	MOV A, M	; get larger no in acc
AHEAD	DCR C	; decrement counter
	JNZ loop	; not over series ?
		go to loop.
	STA 2450 H	; store the result at 2450 H
END	HLT	; stop processing.

67) **Trace the following program and write the purpose of the program :** (October. 2007)

Ans. :

Label	Mnemonics+ operand	Comments
	LXI H, 2500H	; Load HL pair by 2500 H
	MVI B, 01H	; Load immediate register B by 01
	MOV A, M	; Take data from memory to accumulator
	CMA	; Complement the accumulator contents
	ADD B	; Add 01 to accumulator
	INX H	; Increment HL by 1
	MOV M, A	; Transfer content of accumulator to memory
	HLT	; Stop

Ans : The purpose of this program is to find 2's compliment of a number stored at 2500 H and to store at result at 2501 H.

68) Sixteen bytes of data are stored in memory locations at C050H to C05FH. Transfer the entire block of data to new memory location starting at C070H. **(October. 2007)**

Ans :

Label	Mnemonics+ operand	Comments
START	LXI H, C050H	; Set up HL as a pointer to source.
	LXI D, C070 H	; Set up DE as a pointer to destination.
	MVI B, 10H	; Set up B to count 16 bytes.
NEXT	MOV A, M	; get data byte from memory.
	STAX D, M	; store data byte at destination.
	INX H	; increment source pointer.
	INX D.	; increment destination pointer
	DCR B	; decrement count
	JNZ NEXT	; if not zero, go back
END	HLT	; Stop processing.

) Write as assembly language program to copy a block of data having starting address 2000H to a new destination with starting address 3000H. Length of the block is stored at 1FFFH. **(Mar.2008)**

ns :

Label	Mnemonics+ operand	Comments
START	LDA 1FFF	; Copy block length into accumulator
	MOV H, A	; Copy block length from accumulator to Reg H
	LXI B, 2000 H	; Initialise BC pair to starting address of source location
	LXI D, 3000 H	; Initalise DE pair to starting address of destination location
NEXT	LDAX B	; Copy number from source memory location to accumulator
	STAX D	; Copy number from accumulator to destination memory location
	INX B	; Increment source memory pointer contents by one
	INX D	; Increment destination memory pointer contents by one
	DCR H	; Decrement counter by one to count number of transfers
	JNZ Next	; Repeat steps if all data still remain to be copied.
END	HLT	; Stop processing

70) A block of data is stored in memory starting from memory location D001H. The length of the block is stored at memory location D000H. Write an assembly language program to sort the contents of block in ascending order. **(March. 2008)**

Ans. :

Label	Mnemonics+ operand	Comments
Start	MVI B, 00 H	; Initialise register B with data 00.
	LXI H, D000 H	; Initialise H - L pair
	MOV C, M	; Store the length of block in register C
	INX H	; Increment H - L pair 1
	MOV A, M	; Move contents of memory to accumulator
	DCR C	; Decrement count
Up	INX H	; Increment H - L pair
	CMP M	; Compare the contents of accumulator and first memory location.
	JC dn	; Jump to label dn if contents of accumulator is less than that of memory location.
	MOV D, M	; Move contents of memory to register D
	MOV M, A	; Move contents of accumulator to memory location
	DCX H	; Decrement HL register pair
	MOV M, D	; Move contents of register D to memory location
	INX H	; Increment HL register pair
	MVI B, 01 H	; Load immediate data 01H to register B
dn	DCR C	; Decrement the counter stored in register C
	JNZ Up	; Go to label up, it the counter C has not reached zero
	DCR B	; Decrement register B by unity
	JZ Start	; Is zero ? Yes go to label start
	HLT	; Stop processing

71) Write an assembly language program to exchange the two hexadecimal digits of a number stored at memory location 2500H. Store the new number at memory location 2501H. **(March.2008)**

Ans :

Label	Opcode Operand	Comments
	LXI H 2500 H	; Initialise H - L pair memory address 2500H.
	MOV A M	; Get the number in accumulator
	RRC	
	RRC	
	RRC	; Rotate accumulator to right
	RRC	
	INX H	; Increment H - L pair
	MOV M A	; Store contents of accumulator to memory
END	HLT	; Stop processing

72) A block of data is stored in memory locations from C080H. Length of block is stored at C07FH. Write an assembly language program that searches for the first occurrence of data byte ABH in the given block. Store the address of the occurrence in HL register pair. If number is not found, then HL register pair must contain FFFFH. (March.2008)

Ans :

Label	Opcode Operand	Comments
START	LDA C07F H	; Copy block length into accumulator
	MOV C, A	; Copy block length from accumulator to Reg C
	LXI H, C080 H	; Load H - L pair with starting address
	MVI A, AB H	; Initialise search element (AB) in register A
UP	CMP M	; Compare number in memory to the number ABH in accumulator
	JZ end	; Number in memory is AB ? Yes jump to end.
	INX H	; Increment H - L pair
	DCR C	; Decrement contents of block length counter Reg C
	JNZ UP	; Repeat all steps until all locations are checked
	LXI H, FFFF H	; Load H - L pait with address FFFF H
END	HLT	; Stop processing

3) Write an assembly language program to perform the multiplication of two eight bit numbers where multiplicand is stored at memory location 2501H and 2502H. Multiplier is stored at 2503H. Result is to be stored at memory location 2504H and 2505H. (March. 2008)

Ans :

Label	Opcode Operand	Comments
START	LHLD 2501 H	; Get multiplicand in H - L pair
	XCHG	; Multiplicand in D - E pair
	LDA 2503 H	; Multiplier in accumulator
	LXI H, 0000 H	; Initial value of produce equal to 0000 in H - L pair
	MVI C, 08 H	; Count equal to 8 in register C
UP	DAD H	; Shift partial product left by one bit
	RAL	; Rotate multiplier left by one bit
	JNC dn	; Is carry ? No, jump to lable dn
	DAD D	; Product = Product + Multiplicand
dn	DCR C	; Decrement counter stored in register C
	JNZ UP	; Jump, if no zero to label up
	SHLD 2504 H	; Store the result in 2504 and 2505 H
END	HLT	; Stop processing

74) Write a sub-routine to fill the memory locations 2800H to 28FFH with the hexadecimal numbers 00H to FFH respectively. (March. 2008)

Ans:

Label	Opcode Operand	Comments
START	LXI H, 2800 H	; Initialise H - L pair with starting address
	MVI A, 00 H	; Load accumulator with data 00
	MVI B, FF H	; Count in Register B
UP	MOV M, A	; Copy the data 00H in memory location 2800H
	INX H	; Increment H - L pair
	INR A	; Increment the contents of accmulator by one
	DCR B	; Decrement counter
	JNZ UP	; Count = 0 ? No jump to label up
END	HLT	; Stop processing

75) Write an assembly language program to find how many times data BCH appears in a memory block D050H to D059H. Store the count in register C. (October. 2008)

Ans :

Label	Opcode Operand	Comments
START	LXI H, D050H	; Initilize H-L pair to memory address DO5OH
	MVI A, BCH	;Move immediate the data BCH to accumulator
	MVI B, 0AH	; Initialise register B to store the Count.
	MVI C, 00H	; Initialise the register C to OOH.
X2	CMP M	; Compare the Contents of memory location with the data present in accumulator
	JNZ X1	; Jump to label X1 if it is not Zero.
	INR C	; Increment the register C by 1
X1	INX H	; Increment HL - pair by 1
	DCR B	; Decrement register B by 1
	JNZ X2	; Is not Zero ? Jump to label X2.
END	HLT	; Stop processing

76) Write an assembly language program to find the largest number in a block of data starting from the address 3500H. Length of the block is stored at memory location address 34FFH . Store the result at address 4500H . (October 2008)

Ans :

Label	Opcode Operand	Comments
START	LXI H, 34FFH	; Initialise HL - pair with address 34FFH
	MOV C, M	; block length in register C
	SUB A	; Initialise accumulator with OOH
L2	INX H	; Increment HL pair by 1

Label	Opcode Operand	Comments
	CMP M	; Compare the next number with accumulator
	JNC L1	; Number in accumulator greater? Yes, jump to LI
	MOV A, M	;No, Bring the greater number in accumulator
LI	DCR C	; Decrement Count
	JNZ L2	;Count = 0 ? No jump to label L2
	STA 4500 H	;Store largest at location 4500 Hq
END	HLT	; Stop processing

77) Write an assembly language program to add two BCD numbers stored at locations 3500H and 3501H. Place the BCD result in location 3502H and onward with LSB first. **(Oct. 2008)**

Ans :

Label	Opcode Operand	Comments
START	LXI H, 3500H	; Initialise HL pair to memory address 3500 H
	MVI B, OOH	; Initialise register to store MSB of sum
	MOV A, M	; Move first number in accumulator
	INX H	; Get address of next number
	ADD M	; Add next number to accumulator
	DAA	; Decimal adjust accumulator
	JNC L1	; Is Carry ? No, jump to label Ll
	INR B	; Increment register B
L1	INX H	; Increment HL pair by 1
	MOV M, A	; Store LSB of Sum in memory
	MOV A, B	; Move MSB of Sum in accumulator
	INX H	; Increment HL pair by 1
	MOV M, A	; Store MSB of Sum in memory
END	HLT	; Stop processing

78) Write an assembly language program to subtract the number stored in memory location 3601H from the number stored in memory location 3600H. Store positive result at location 3602H. **(March 2002, Oct.200**

Ans :

Label	Opcode Operand	Comments
START	LXI, H, 3600 H	; Initialise HL pair to memory address 3600H
	MOV A, M	; Move memory Content to accumulator
	INX H	; Increment HL pair by 1
	SUB M	; Subtract memory Content from accumulator
	JP LOOP	; If result is positive jump to LOOP
	CMA	; Complement the contents of accmulator

Label	Opcode Operand	Comments
	ADI 01	; Take 2's complement by adding 1.
LOOP	INX H	; Increment HL pair by 1
	MOV M, A	; Store the result in memory location
END	HLT	; Stop processing

79) Write an assembly language program to divide a byte stored at location 2050H by a non zero byte stored at location 2051H. Place the quotient at memory location 2052H and the remainder at location 2053H. **(October 2008)**

Ans :

Label	Opcode Operand	Comments
START	MVI C, OOH	; Intitialise Contents of register C to Zero
	LXI H, 2050H	; Load the HL pair with the address of the dividend
	MOV A, M	; Copy dividend from memory to accumulator
	INX H	; Make HL pair point at the address of the divisor
LOOP	CMP M	; Compare the divisor to the accumulator Contents
	JC NEXT	; If the divisor is smaller than the accumulator contents, then jump to NEXT to copy results to memory
	INR C	; Increment Contents of register C by unity
	SUB M	; Subject the divisor from accumulator Contents
	JMP LOOP	; Unconditionally jump to LOOP to Continue process
NEXT	INX H	; Increment HL Contents by Unity to point at 2052H
	MOV M, C	; Copy quotient from register C to memory location 2052 H.
	INX H	; Increment HL contents by Unity to point of 2053 H.
	MOV M, A	; Copy remainder from accumulator to memory to memory 2053 H.
END	HLT	; Stop processing

80) Write an assembly language program to transfer a block of data stored in memory location from D100H to D1FFH in reverse order in new memory location starting at D200H. **(Oct. 2008)**

Ans :

Label	Opcode Operand	Comments
START	LXI H, D1FFH	; Intialise HL pair with address for last location of Source block
	LXI B, D200H	; Initialise BC pair with address for first location of destination block
	MOV D, L	; Get the count in Register D.

Label	Mnimonics/Operands	Comments/Remarks
MI	MOV A, M	; Get the number of accumulator
	STAX B	; Store the number of address pointed to by B-C pair
	DCX H	; Decrement HL pair
	INX B	; Increment B-C pair
	DCR D	; Decrement Count
	JNZ MI	; Is Count Zero? No, jump to label MI
END	HLT	; Stop processing

81) **Write an assembly language program to exchange 8 bit number stored in memory location 4000 H. Store new number at memory location 4001 H.** **(March - 2009)**

Ans :

Label	Mnimonics/Operands	Comments/Remarks
	LXI H,4000H	; Load the HL pair at 4000
	MVI C, 08 H	; Set counter for 8 bit
	MOV A, M	; Take number in acc
UP	RRC	; Rotate the contents of accumulator
	DCR C	; Decrement count
	JNZ UP	; Is not zero ? go to up
	STA 4001 H	; Store result
	HLT	; Stop processing

82) **Write assembly language program to find sum of all the numbers stored in a memory block. Block starts from 2CO5H and length of the block is at 2CO4H. Store the sum at 2CO3H.** **(Oct. 2009)**

Ans :

Label	Mnimonics/Operands	Comments/Remarks
START	LXI H, 2C04H	; HL pair points to length
	MOV C, M	; length moves to Register C
	SUB A	; Initialize sum = 0
UP	INX H	; Increment pointer by 1
	ADD M	; Add accumulator with content
		DCR C Decrement length by 1
	JNZ UP	; is not zero, repeat
	STA 2C03H	; Store sum to 2CO3H
	HLT	; Stop

83) Write assembly language program to divide all the numbers of a block by 2. Block is from 4000H to 4009 H. **(Oct. 2009)**

Ans :

Label	Mnimonics/Operands	Comments/Remarks
START	LXI H, 4000 H	; Initialize HL pair by 4000 as a pointer to block
	MVI C, 0AH	; Set Counter Register by OA
UP	MOV A, M	; Move the byte from memory to accumulator
	RRC	; Divide accumulator by 2
	MOV M, A	; MOV the result from accumulator to memory
		; DCR C Decrement counter by 1
	JNZ UP	; is not zero, repeat
	HLT	; stop

84) Write assembly language program to count number of one (1) in 8 bit number which is stored at 208BH. **(Oct. 2009)**

Ans :

Label	Mnimonics/Operands	Comments/Remarks
START	LDA 208BH	; Load accumulator by operand
	MVI C, 08H	; Initialize counter C by 08H
	MVI E, 00H	; Initialize counter E by 00H
UP	RRC	; Check for one
	JNC SKIP	; Is digit is zero, SKIP does not increment count
	INR E	; Is digit I increment count
SKIP	DCR C	; Decrement counter C by 1
	JNZ UP	; is not zero, repeat
	HLT	; Stop.

85) Write assembly language program to fill memory block from 2000H to 2009 H with data BBH and 44H alternately. **(Oct.2009)**

Ans :

Label	Mnimonics/Operands	Comments/Remarks
START	LXI H, 2000H	; Set HL pair at starting address
	MOV C, OAH	; Register C as counter
	MVI A, BBH	; Copy BBH to Accumulator
UP	MOV M, A	; Copy [A] to Memory Location
	CMA	; Complement Accumulator to get 44H
	INX H	; get next address
	DCR C	; Decrement counter by one
	JNZ, UP	; is counter is zero? No Go [UP]
	HLT	; Yes stop processing

86) Write assembly language program to find smallest number in a memory block. Block starts from 2600H . Length of the block is at 25FFH. Store the smallest number in register E. **(October 2009)**

Ans :

Label	Mnimonics/Operands	Comments/Remarks
START	LXI H, 25FFH	; Store the length
	MOV C, M	; in Register C
	INX H	; Get starting address
	DCR C	
	MOV A, M	; Copy first number in accumulator
	MVI E, 00	; Register E = 00
UP	INX H	; Go to next number address
	CMP M	; Compare two numbers
	JC DN	; is number in accumulate is smaller?
		Yes then Jump to (DN)
	MOV A, M	; No copy smaller number to accumulator
DN	DCR C	; Decrement C by one
	JNZ UP	; Jump to (UP) until C becomes zero
	MOV E, A	; Store the result in Register E
	7HLT	; Stop

87) Write assembly language program to arrange two numbers stored at 1201 H and 1202 H in descending order. **(October 2009)**

Ans :

Label	Mnimonics/Operands	Comments/Remarks
START	LXI H, 1201H	; Copy number stored at
	MOV B, M	; 1201 to Register B
	INX H	; HL pair pointing at 1202 H
	MOV A, M	; Copy number at 1202H to Accumulator
	CMP B	; Compare two numbers
	JC END	; are they in order? Yes jump to (END)
	MOV M, B	; Contents of 1201 are at 1202H
	DCX H	; HL pair at 1201H
	MOV M, A	; Contents of 1202 are at 1201
END	HLT	; Stop

88) Write a program in assembly language to find greatest number among a contents of block of memory which starts from D001H, the lengthe of block is stored at D000H. Store the greatest number at the end of block. (March - 2010)

Ans :

Label	Mnemonics	Comments
START	LXI, D000H	; Load HL with D000H
	MOV C, M	; Move (M) to Reg. C
	DCR C	; Decrement C by 1
UP	MOV A, M	; Move (M) to ACC
	INX H	; Increment HL by 1
	CMP M	; Compare (M) with ACC
	JNC DOWN	; Jump if No Carry to DCR C
	MOV A, M	; Move (M) to ACC
DOWN	DCR C	; Decrement C by 1
	JNZ UP	; Jump if No Zero to MOV A , M
	INX H	; Increment HL by 1
	MOV M, A	; Move [A] to memory
	HLT Stop	; Stop

89) Write a program in assembly language to sum the series. Stored from D001, length of series is at D000H. Store result from D100H. (March - 2010)

Ans :

Label	Mnemonics	Comments
START	LXI H, D000H	; Load HL with D000H
	MOV C, M	; Move (M) to Reg. C
	MVI A, 00H	; Move 00 to ACC
	MVI B, 00H	; Move 00 to Reg. B
L2	INX H	; Increment HL
	ADD M	; Add (M) to ACC
	JNC L 1	; Jump if No Carry to L1
	INR B	; Increment B
L1	DCR C	; Decrement C
	JNZ L2	; Jump if No Zero to L2
	LXI H D100H	; Move D 100 to HL
	MOV M, A	; Store LSBs of sum to D100H
	INX H	; Increment HL
	MOV M, B	; Store MS Bs
	HLT	; Stop

90) Write a program in assembly language to substract contents of memory location D001H from the contents of memory location D00H. Store absolute difference at D002H. (Mar. - 2010

Ans :

Label	Mnemonics	Comments
	LXI H, D001 H	; Load HL with the D000H
	MOV A, M	; Move (M) to ACC
	INX H	; Increment HL by 1
	SUB M	; Substract (M) from (A)
	JNC L1	; Jump if No carry to L1
	CMA	; Compliment ACC
	INR A	; Increment ACC
L1	INX H	; Increment HL by 1
	MOV M	; Move [A] to Memory
	HLT	; Stop

91) Give appropriate comments to the following program : (March - 2010

Label	Mnemonics	Comments
	STC	
	CMC	
	MVI A,08H	
	LXI H, D001H	
LOOP	MOV M, A	
	INX H	
	DCR C	
	JNZ LOOP	
	HLT	

Ans :

Label	Mnemonics	Comments
	STC	; Set Carry
	CMC	; Complimentary Carry
	MVI A, 08H	; Move immediate 08 to ACC
	MVI C, 0AH	; Move immediate 0AH to C register
	LXI H, D001H	; Load with Doo1H
LOOP	MOV M, A	; Move [ACC] to Memory
	INX H	; Increment HL by 1
	DCR C	; Decrement C by 1
	JNZ LOOP	; Jump if No Zero to Loop
	HLT	; Stop

92) **There is block of memory stored from D001H, the length of block is stored at memory location D000H. Write a program in assembly language to chek, whether contents of these of these blocks are in sequence (consecutive) or not.** (March - 2010)

If contents of blocks are in sequence (consecutive) then memory location D100H should contain 00H, else FFH.

Ans :

Label	Mnemonics	Comments
	LXI H, D000H	; Load HL with D000H
	MOV C, M	; Move [M] to C
	DCR C	; Decrement C
	INX H	; Increment HL by 1
L2	MOV A, M	; Move [M] to ACC
	INR A	; Increment ACC
	INX H	; Increment HL by 1
	CMP M	; Compare [A] with memory
	JNZ L1	; Jump if No Zero to L1
	DCR C	; Decrement C
	JNZ L2	; Jump if No Zero to L2
	LXI H D100H	; Load HL with D100H
	MVI M, 00H	; Move 00 to Memory
	JMP L3	; Jump to L3
L1	LXI H, D00H	; Load HL with D100
	MVI M, FFH	; Move FF to Memory
L3	HLT	; Stop

93) **Trace the following program and show contents of the following by. filline blanks :** (Mar. 2010)

Lable	Mnemonics
	MVI A, 05H
	LXI H, D001H
	MVI C, 05H
LOOP	MOV M, A
	DCR A
	INX H
	DCR C
	JNZ LOOP
	HLT

[D005] = ______

[A] = ______

[C] = ______

Reg. H = ______

Reg. L = ______

Ans : Trace program and show contents of the following by filling the blanks :

[D005] = 01H

[A] = 00H

[C] = 00H

Reg. H = D0H

Reg. L = 06H

94) A series of numbers are stored in memory locations from C001H to C008H. Write a program in assembly language to find largest number among these numbers. Store largest number in memory location C009H. **(October 2010)**

Ans :

Label	Mnemonics	Comments
	LXI H C001H	; Set HL Pair to C001H
	MVI A 00 H	; Largest = 00 H
	MVI C 08 H	; Set count = 08H
LOOP	CMPM	; Compare with previous no. Is it greater ?
	JNC AHEAD	; No. large in Acc. go to AHEAD
	MOV A M	; Get large in Acc.
AHEAD	INX H	; Increment HL pair
	DCR C	; Decrement count
	JNZ LOOP	; Repeat if count □ 0
	MOV M A	; Store large in C009H
	HLT	; Stop

95) Write an assembly language program to count number of times the data A4H is found in a block of memory locations starting from 4000H. Length of block is stored in location 3FFFH. Store result in -location 5000H. **(October 2010)**

Ans :

Label	Mnemonics	Comments
	LXI H, 3FFFH	; Load HL pair with 2FFFH
	MOV C, M	; Get count in C reg.
LOOP	INX H	; Increment HL Pair
	MOV A, M	; Get no. in Acc.
	CPI A4H	; Check A4 with Acc.
	JNZ NEXT	; if number not found, then jump to NEXT
	INR B	; Store count in B

Label	Mnemonics	Comments
	DCR C	; Decrement count
	JNZ LOOP	; Repeat loop if count ≠ 0
	MOV A, B	; Store count in Acc.
	STA 5000 H	; Store result At 4000H
	HLT	; Stop

96) **Write an assembly language program to fill memory locations 3000H to 30FFH with the hexadecimal numbers 00H to FFH respectively.** **(October 2010)**

Ans :

Label	Mnemonics	Comments
	LXI H, 3000H	; Initialize HL pair with starting address
	MVI A, 00H	; A = 0
	MVI B, FFH	; Count in reg. B
UP	MOV M, A	; Copy data 00H in 3000H
	INX H	; Increment HL pair
	INR A	; Increment content in A by 1.
	DCR A	; Decrement count
	JNZ UP	; Jump to label up if count is not zero
	HLT	; Stop

97) **Write an assembly language program to copy a block of data having starting address 7900H to the new location 9100H. The length of block is stored at memory location 78FFH.** **(October 2010)**

Ans :

Label	Mnemonics	Comments
	LXI H, 78FFH	; Load HL pair with 78FFH
	LXI D, 9100H	; Starting address of destination
	MOV C, M	; Move count in Reg. C
	INX H	; Increment HL Pair
LOOP	MOV A, M	; Transfer memory to Acc.
	STA X D	; Store Acc. to new location
	INX H	; Increment HL Pair
	IN X D	; Increment DE Pair
	DCR C	; Decrement count
	JNZ LOOP	; Jump to loop if count is not zero
	HLT	; Stop

98) **A block of data is stored in memory locations from D001 H The length of block is stored in memory location D000H. Write a program in assembly language that searches for first occurrence of data 11 H in given block. Store address of this occurrence in H-L pair. If the number is not found, then H-L pair should contain 0000H.** **(October 2010)**

Ans :

Label	Mnemonics	Comments
	LXI H, D000H	; Load HL pair with D000H
	MOV C, M	; Move count in Reg. C
	MVI A, 11H	; Set Acc. = 11H
LOOP	INX H	; Increment HL Pair
	CMP M	; Compare memory and Acc.
	JZ ESCAPE	; If memory location in block =11, then jump
	DCR C	; Decrement count
	JNZ LOOP	; Repeat if count ≠ 0
	LXI H, 0000H	; Set HL pair to 0000H if number found
ESCAPE	HLT	; Stop

9) **A Hex number is stored at location C000H. Write an assembly language program to interchange its digit. The new number is to be stored at C001H. Add original number with new number and store result at location C010H.** **(October 2010)**

s :

Label	Mnemonics	Comments
	LXI H, C000H	; Load HL pair with C000H
	MOV A, M	; Move number in Acc.
	RRC	; Rotate right one bit four times for nibble exchange
	RRC	
	RRC	
	RRC	
	STA C001 H	; Store no. in C001 H
	ADD M	; Add original number with exchange
	STA C010H	; Store result in C010H
	HLT	; Stop

100) **Write an Assembly Language Program to separate nibbles of a number stored at memory location 2000H. Multiply separated nibbles and store result.** **(March 2011)**

Ans :

Label	Mnemonics	Comments
	LXI H, 2000H	; set HL = 2000H
	MOV A, M	; move memory to A
	MOV B, M	; move memory to B
	ANI OFH	; get lower nibble
	MOV C, A	; store it in C
	MOV A, B	; get B to A

Label	Mnemonics	Comments
	ANI F0H	; get higher nibble
	RRC	;
	RRC	; Rotate A to right without Carry
	RRC	;
	RRC	;
	MOV D, A	; Store it in D
	MVI A, 00H	; clear A
rep	ADD D	; add A and D
	DCR C	; decrement C
	JNZ rep	; jump, if no zero to rep.
	STA 4000H	; store A at 4000H
	HLT	; stop program

101) Writ e a program in Assembly Language. to transfer a block of data from 1050 to 1059 to memory location whose starting address is 1070H. (March 2011)

Ans :

Label	Mnemonics	Comments
	MVI H, 0AH	; set H = 0AH
	LXI B, 1050H	; set BC = 1050 H
	LXI D, 1070H	; set DE= 1070H
rep	LDAX B	; get 1050H contents
	STAX D	; store at 1070 H
	INX B	; increment BC
	INX D	; increment DE
	DCR H	; decrement H
	JNZ rep	; jump, if no zero to rep
	HLT	; stop program

102) Write an Assembly Language Program to count number of even data bytes occurring in a block starting from memory location C030H to C039H. Store result at the memory location C040H. (March 2011)

Ans:

Label	Mnemonics	Comments
	LXI H, 2000H	; set HL = 2000H
	MVI C, 00H	; clear C reg
	MVI B, 0AH	; set B = 0AH
	LXI H, C030H	; set HL = C030H
rep	MOV A, M	; get M to A
	RRC	; rotate A to right
	JC next	; jump, if carry to next
	INR C	; increment C

Label	Mnemonics	Comments
next :	INX H	; increment HL
	DCR B	; decrement B
	JNZ rep	; jump, if no zero to rep.
	MOV A, C	; get C to A
	STA C040H	; store A at C040 H
	HLT	; stop program

103) Write an Assembly Language Program to exchange position of digit of number stored at C040H. Multiply original number with the exchanged number, the result to be stored at memory location starting from C041H onwards. **(March 2011)**

Ans :

Label	Mnemonics	Comments
	MVI C, 00H	; clear C register
	LXI H, C040H	; HL = C040H
	MOV A, M	; get M to A
	MOV B, M	; get M to B
	RRC	; rotate A
	RRC	; to right
	RRC	; without carry
	RRC	;
	MOV D,A	; get A to D
	MVI A, 00H	; clear A
rep	ADD D	; add A and D
	JNC next	; jump, if no carry to next
	INR C	; increment C
	next DCR B	; decrement B
	JNZ rep	; jump, if no zero to rep.
	INX H	; increment HL
	MOV M, A	; get A to M
	INX H	; increment HL
	MOV M,C	; get C to M
	HLT	; stop program

104) Write an Assembly Language program to add two 16 bit numbers. The numbers are stored at memory location C030H and C031H, and the second number stored at C032H and C033H. Store result at memory location C034H and C035H. Store final carry at C036H. **(March 2011; July 18)**

Ans. :

Label	Mnemonics	Comments
	MVI A, 00H	; clear A
	LHLD C030H	; load HL directly
	XCHG	; exchange HL and DE
	LHLD C032H	; load HL directly
	DAD D	; double add HL and DE
	JNC next	; jump, if no carry to next
	INR A	; increment A
next	SHLD C034H	; store HL directly
	STA C036H	; store A at C036H
	HLT	; stop program

105) Write a program in assembly language to find the position of a data 05H in a block of memory D001H to D005H. If data is found then store the position of data at memory location D100H else store 00H at the same memory location. **(Oct. 2011)**

(Note : It is assumed that data 05 may present only at once.)

Label	Mnemonics	Comments
	MVI A, 05 H	; more immediate data 05H to Acc.
	MVI C, 05 H	; move immediate data 05H to Reg. C
	MVI D, 01 H	; move immediate data 01H to reg. D
	LXI H, D001H	; Load HL with D001H
UP	CMP M	; compare memory content with Acc.
	JZ NEXT	; jump if zero to label NEXT
	INX H	; increment HL pair
	INR D	; increment DE pair
	DCR C	; Decrement C reg.
	JNZ UP	; jump if No zero to label UP
	LXI H, D100H	; Load HL with D100H
	MVI M, 00H	; move 00 to memory location D100H
NEXT	IMP L1	; jump to halt
	LXI H, D100 H	; Load HL with D100 H
L1	MOV M, D	; move contents in D to D100 H
	HLT	; stop

106) Write a program is assembly language to double the contents of block of memory from D0O1H to DOOAH. Store the doubled contents at same memory locations.
(Note : It is assumed that contents are not exceeding OFH.) **(Oct. 2011, July 2010)**

Ans. :

Label	Mnemonics	Comments
LOOP	MVI C, 0AH	; move count OA to reg. C
	LXI H, D001 H	; Load HL with D001 H
	MOV A, M	; move no. in block to Acc.
	RAL	; Rotate accumulator left .,. ..
	MOV M, A	; Move Acc. content to memory
	INX H	; increment HL pair 11-'
	DCR C	; Decrement count
	JNZ LOOP	; jump to label LOOP for next no
	HLT	; stop

7) Write a program to exchange the two nibbles, stored at 2500H. Store the exchanged it at number at 2501H. **(Oct. 2011)**

Label	Mnemonics	Comments
	LXI H, 2500 H	; Load HL with 2500 H
	MOV A, M	; Get no. in 2500 H to Acc.
	RRC	
	RRC	; Rotate 4 times to exchange nibble
	RRC	
	RRC	
	INX H	; increment HL pair to point 2501 H
	MOV M, A	; move Acc. contents to 2501 H
	HLT	; stop

108) Write a assembly language program to copy the contents of a block of memory which is from 2501H to 2505H, to another block begins from 3501H. **(Oct. 2011)**

Ans. :

Label	Mnemonics	Comments
LOOP	MVI C, 05 H	; Load block count 05H in C reg.
	LXI H, 2501 H	; Load HL with 2501 H
	LXI D, 3501 H	; Load DE with 3501 H
	MOV A, M	; Move no. pointed by HL to Acc.
	STAX D	; Store Acc. to memory pointed by DE.
	INX H	; increment HL pair
	INX D	; increment DE pair
	DCR C	; Decrement block count
	JNZ LOOP	; jump to exchange next no.
	HLT	; stop

109) There are two blocks of memory, one is from 2,501H to 2505H. Another is from 3501H to 3505H. Write a program in assembly language to check weather, contents of these two blocks are exactly same or not. **(Oct. 2011)**

If contents are same then memory location D100H should contain OOH else FFH.

Ans.:

Label	Mnemonics	Comments
L2	MVI C, 05 H	; Load block count 05 H in C reg.
	LXI H, 2501 H	; Load HL with 2501 H
	LXI D, 3501 H	; Load DE with 3501 H
	LDAX D	; Load Acc. by memory pointed by DE
	CMP M	; Compare-data pointed by HL pair with Acc.
	JNZ L1	; jump if no. is not same to label L1
	INX H	; increment HL pair
	INN D	; increment DE pair
	DCR C	; Decrement count
	JNZ L2	; if count is not zero then jump to L2
	LXI H, D100 H	; Load HL with D100 H
	MVI M, 00 H	; Load OOH in memory D100 H
L1	DAP L3	; jump to stop
	LXI H, D100 H	; Load HL with D100 H
	MVI M, FFH	; store FFH in memory D100 H
	HLT	; stop

110) Write a program in assembly language to rotate the content of memory location D000H toward left by one bit position and add original contents with rotated number and store the result from DOO1H. **(Oct. 2011)**

Ans. :

Label	Mnemonics	Comments
LOOP	MVI C, 00 H	; Clear C reg. To store MSB
	LXI H, D000 H	; Load HL with D000H
	MOV A, M	; move no. in Acc.
	MOV B, A	; move no. in Acc. to B reg.
	RAL	; Rotate accumulator left through carry
	ADD B	; Add Acc. i.e. rotated no. with B reg.
	JNC LOOP	; jump if no carry to LOOP

111) An 8 it number is stored in memory location 4400H. Write an assembly language program to count 'Zero' in the given number. Store count in memory location 4500H. **(March 2012)**

Ans. :

Label	Mnemonics	Comments
	MVI C, 08 H	; Get rotational count in Reg. C
	MVI B, 00 H	; Initialize Reg. B rare
	LXI H, 4400 H	; Load HL with 4400 H
	MOV A, M	; take no. in Accumulator
UP	RRC	; Rotate Acc. right by 1 bit s:
	JC Down	; is carry? Yes then jump to label Down
	INR B	; Count no. of zero in Reg. B .._
Down	DCR C	; Decrement test count
	JNZ UP	; is zero? No then jump to label UP
	MOV A, B	; Get count in Acc.
	STA 4500	; Store zero count in 4500 H
	HLT	; stop

112) **A series of numbers are stored in memory locations from C001H to C008 H. Write a program in assembly language to find smallest number among these numbers. Store smallest number in memory location C009H.** **(March 2012)**

Ans. :

Finding of smallest Number

Label	Mnemonics	Comments
LOOP	LXI H, C001 H	; Set HL to C001 H
	MVI A, FF H	; smallest = FF H = Acc.
	MVI C, 08 H	; set count = 08 H
	CMP M	; Compare, is smallest
	JC AHEAD	; if smallest in A then jump to label AHEAD
	MOV A, M	; Get smaller no. in A reg.
	INX H	; increment HL pair
	DCR C	; Decrement count
	JNZ LOOP	; Repeat if count # 0
	MOV M, A	; store smallest no. in C009 H
	HLT	; stop

113) **Write an assembly language program to counter number of odd data byte occurring in a block starting from memory location AOO1H to AOFFH. Store result at memory location B000H.** **(March 2012)**

Ans.: **Count No. of odd data in a block**

Label	Mnemonics	Comments
	MVI H, A001 H	; Load HL with A001 H
	MVI C, FF H	; store count FF in reg. C
	MVI B, 00 H	; set B = 0 for count
LOOP	INX H	; increment HL pair 1l.
	MOV A, M	; move no. in Acc.
	RRC	; Rotate right to check odd
	JNC AHEAD	; if no carry i.e. if no. is even then jump td label
	INR B	AHEAD
AHEAD	DCR C	; if carry, increment count
	JNZ LOOP	; Decrement test count „
	MOV A, B	; if count # 0 then jump to label LOOP
	STA B000H	; store count in Acc.
	HLT	; store result in B000H
		; stop

114) Hex number is stored at location ABOOH. Write an assembly language program to interchange its digit. The new number is to be stored at ABO1H. Add original number with new number and store result at location ABCDH. **(March 2012)**

Ans.: **Interchange given no. and add with previous no.**

Label	Mnemonics	Comments
	LXI H, A1300 H	; Load HL with ABOO H i.e. given no.
	MOV A, M	; Get given no. in Acc.
	RRC	; Rotate 4 times to exchange nibbles of given no.
	RRC	
	RRC	
	RRC	
	INX H	; Increment HL pair to point AB01 H
	MOV M, A	; Store exchanged no. in AB01 H
	DCX H	; Decrement HL pair to point AB00 H
	ADD M	; Add exchanged and previous no.
	STA ABCD	; Store result in ABCD
	HLT	; Stop

115) Write an assembly language program to add two BCD numbers stored at locations. AB00H and AB01H. Place BCD result in location ABO2H and onwards starting with LSB. **(March 2012)**

Ans. : **Add two BCD number**

Label	Mnemonics	Comments
	LXI H, AB00 H	; Load HL with AB00 H
	MVI B, 00 H	; Store MSB of sum in reg. B
	MOV A, M	; Move no. in Acc.
	INX H	; increment HL pair
	ADD M	; Add no. in AB00 H with AB01 H
	DAA	; Decimal adjust accumulator
	JNC GO	; is carry ? no then jump to label GO
	INR B	; Increm6nt reg. B
GO	STA AB02 H	; Store LSB of sum in location AB02 H
	MOV A, B	; Get MSB in accumulator
	STA AB03 H	; Store MSB of sum in location AB03 H
	HLT	; Stop

116) Write a program in assembly language to find 2's Complement of 8 bit number stored in memory location C000H. Store result at memory location. C001H. **(March 2012)**

Ans.: **2's complement of 8 bit number**

Label	Mnemonics	Comments
	LXI H, C000H	; Load HL with C000 H
	MOV A, M	;Get no. in Acc.
	CMA	; Complement given number
	INR A	; increment A reg. By 1 to get 2's complement
	INX H	; increment HL pair
	MOV M, A	; place result in C001 H
	HLT	; stop

117) Write an Assembly Language Program to multiply the given BCD data at location C050H and C051Fl. Store the result in C060H and C061H respectively. **(Oct. 2012)**

Ans. :

Label	Mnemonics	Comments
	MVI A,00H	; clear Accumulator
	MVI C, 00H	; clear c reg
	LXI H, C050H	; initialize HL with C050 H
	MOV B, M	; Get data from m to B

Label	Mnemonics	Comments
	INX H	; increment HL by 1
UP	ADD M	; Add m with A
	DAA	; Decimal adjust Accumulator
	JNC Next	; Jump if no carry to next
	INR C	; increment C reg
Next	DCR B	; Decrement B reg
	JNZ UP	; jump if no zero to up
	LIX A, CO6OH	; Initialize HL pair
	MOVM,A	; Get data from A to m
	INX H	; Increment HL by 1
	MOV M , C	; Get data from c to m
	HLT	; stop

118) Write a program in assembly language that converts a BCD number stored at C030H to its Hexadecimal Equivalent. Store the hexadecimal result in C031H. **(Oct. 2012)**

Ans. :

Label	Mnemonics	Comment
	LXI H, C030 H	; Initialize HL pair with co30 H
	MOV A, M	; Get data from M to A
	MOV B M	; Get data from M to B
	ANI OF H	; Logical AND with Accumulator
	MOV C, A	; Get data in C
	MOV A, B	; Get data from B to A
	ANI F0 H	; Logical AND with Accumulator
	RRC	
	RRC	; Rotate Accumulator four times right
	RRC	
	RRC	
	MOV D, A	; Get data from A to D
	MVI A, 00H	; clear Acc
	MVI E, 0A H	; set E = 0AH
UP	ADD D	; Add D with A
	DCR E	; Decrement E

Label	Mnemonics	Comment
	JNJ UP	; Jump if no zero to up.
	ADD C	; Add c with A
	INX H	; Increment HL A to M
	HLT	; stop

119) Write an Assembly Language Program that multiplies the original number. Stored at C030H with its lower nibble. Store the result starting from C031 H onwards. **(Oct. 2012)**

Ans. :

Label	Mnemonics	Comment
	MVI C, 00H	; Clear C reg
	LXI H, C030 H	; Initialize HL with c030H
	MOV A, M	; Get data from M to A
	MOV B, M	; Get data from m to B
	ANI OFH	; Logical AND ACC
	MOV D, A	; Get data from A to D
	MVI A, 00H	; Clear ACC
GO	ADD B	; Add B with A
	JNC next	; jump if no carry to next
	INR C	; Increment C reg
Next	DCR D	; Decrement D reg
	JNZGO	; Jump if no zero to go
	INX H	; increment HL by 1
	MOV M, A	; Get data from A to M
	INX H	; Increment HL by 1
	MOV M, C	; Get data from C to M
	HLT	; stop

120) Write assembly language program to count number of even data bytes occurring in a block stored from memory location C0511-1 and onwards. The length of block is stored in location C050H. Store result in location. C060H. **(March 2013)**

Ans. :

Label	Instruction	Comments
START	LXI H, C050 H	; Initialize HL pointer to C050 H
	MOV C, M	; Get length of block in reg C
	MVI B, 00H	; Initialize reg. B to store count

Label	Instruction	Comments
	INX H	; Increment HL pair by 1
UP	MOV A, M	; Get the number in accumulator
	RRC	; Check even number
	JC DOWN	; Jump on carry to label DOWN
	INR B	; No carry increment count
DOWN	INX H	; Increment HL pair by 1
	DCR C	; Decrement C by 1
	JNZ UP	; Is zero ? No jump to label UP
	MOV A, B	; Store count in register A
	STA C060H	; store result in C060H
END	HLT	; stop

121) **Write an assembly language program to perform multiplication of two 8-bit numbers where multiplicand is stored at the memory locations C051H and C052H and multiple is stored at C053H. The result is to be stored at memory location address C054H to C055H.** **(March 2013)**

(Note : 8-bit multiplicand is extend to 16-bit)

Ans. :

Label	Instruction	Comments
START	LHLD C051H	; Get multiplicand in HL pair
	XCHG	; multiplicand in DE pair
	LDA C053H	; Multiplier in accumulator
	LXI H, 0000 H	; Initial value of product = 0000H
	MVIC, 08H	; count equal to 08 in reg. C
BACK	DAD H	; shift partial product left by one bit
	RAL	; Rotate multiplier left by 1 bit, Is multiplier bit = 1
	JNC GO	; No jump to. label GO
	DAD D	; Product = product + multiplicand
GO	DCR C	; Decrement count
	JNZ BACK	; jump if no zero to label BACK
	SHLD C054H	; store result at C054H
END	HLT	; STOP

122) **Write assembly language program to count occurrence of the data. ABH in a memory block starting from 4000H to 400FH. Store count at memory location 4500H.** **(March 2013)**

Ans. :

Label	Instruction	Comments
START	MVI C 00H	; Initialize reg C with 00H
	MVI A, ABH	; Get data ABH in accumulator
	LXI H, 4000 H	; Initialize HL pointer to 4000H
	MOV B, 10 H	; Get count in register B
LOOP	CMP M	; Compare no in M with ACC
	JNZ NEXT	; Is zero ? No jump to label NEXT
	INR C	; Increment count C by 1
NEXT	INX H	; Increment HL pair by 1
	DCR B	; Decrement count
	JNZ LOOP	; Is zero ? No jump to label LOOP
	MOV A, C	; Yes move count to A
	STA 4500H	;Store count in 4500H
END	HLT	;stop

123) A block of data is stored in memory locations from 7500 H to 75FFH, Write an assembly language program to transfer block in reverse order to memory location 7600H and onwards. **(March 2013)**

Ans. :

Label	Instruction	Comments
START	LXI H, 75 FFH	; Initialize HL with 75 FF H
	LXI B, 7600H	; Initialize BC with destination address
	MOV D, L	; Get count FF H in reg. C
BACK	MOV A, M	; Get number in accumulator
	STAX B	; Store no. at address pointed by BC
	DCX H	; Decrement HL
	INX B	; Increment BC
	DCR D	; Decrement count
	JNZ BACK	; Is count zero & No then jump to BACK
END	HLT	; stop

124) Write an assembly language program to find largest element in block of data. The length is in memory location D000H and block begins in memory location D002H. Store maximum in D000H. Assume that all number are 8-bit unsigned binary numbers. **(March 2013)**

Ans. :

Label	Instruction	Comments
START	LXI H, D 001H	; Address for count in HL pair
	MOV C, M	; Get count in reg. C
	SUB A	; clear accumulator
LOOP	INX H	; Go to address of next memory
	CMP M	; Compare memory with ACC
	JNC AHEAD	; No larger in ACC, go to label. AHEAD
	MOV A, M	; Get larger no. In acc
AHEAD	DCR C	; Decrement count
	JNZ LOOP	; Go to label loop
	STA D000H	; Store result at D000H
END	HLT	; stop

125) Write an Assembly Language Program to Count the Number of times data 7EH is found in a block of memory location starting from 3000H. Length of block is stored in location 2FFFH. Store the result in location 2000H. (Oct. 2013)

Ans. :

LABEL	MNEMONICS	COMMENTS
START	LXI H, 00 H	; Set count = 00H
	LXI H, 2FFF H	; Set HL pointer to 2FFF H
	MOV C, M	; Get count in register C
LOOP	INX H	; [H-L] = [H-L] + 1
	MOV A, M	; Memory contents in A
	CPI 7EH	; Check whether [H-L] = 7EH or not
	JNZ NEXT	; If zero ? No – jump to NEXT
	INR B	; Count = count + 1
NEXT	DCR C	; Decrement count
	JNZ LOOP	; Repeat LOOP if count ≠ 0
	MOV A, B	; Store count in A reg.
	STA 2000 H	; Store count in 2000 H.
END	HLT	; Stop

126) Write a program in Assembly Language that multiply two 8-bit numbers stored in memory location D000H and D001H. Store the two byte result in consecutive memory locations starting from D002H. (Oct. 2013)

Ans. :

LABEL	MNEMONICS	COMMENTS
START	LXI H, 0000 H	; Set initial product = 0
	LDA, D000 H	; Set [A] = N1
	MOV E, A	; Set [E] = N1
	LDA D001H	; Set [A] = N2
LOOP	MVID, 00H	; Set [D] = 00H
	DAD D	; Product = product + N1
	DCR A	; N2 = N2 – 1
	JNZ LOOP	; Repeat if N2 ≠ 0
END	SHLD D002 H	; Store product in D000 and D001 H.
	HLT	; Stop

127) **Write an Assembly Language program that divides two one byte hex numbers where dividend is stored in memory location C000H and divisor is stored in memory location C001H. store quotient and reminder in memory location C002H and C003H respectively.** **(Oct. 2013)**

Ans. :

LABEL	MNEMONICS	COMMENTS
START	LXI H, C000 H	; Set HL pointer to divident
	MVI C, 00 H	; Set initial quotient = 00H
	MOV A, M	; Set A = Divident
	INX H	; Set HL pointer to divisor
LOOP	CMPM	; IS N1 ≥ N2 ?
	JC Escape	; Go to Escape if N1 < N2
	SUB M	; N1 = N1 – N2
	INR C	; Quotient = Quotient + 1
	JMP LOOP	; Jump to again compare N1 and N2
ESCAPE	INXH	; Increment HL pair
	MOV M, C	; Store quotient in C002 H
	INX H	
	MOV M, A	; Store remainder in C003H
END	HLT	; Stop

128) **Write an ALP to calculate Sum of Series of Number. The length of the series is in memory location C100H and Series itself begins in memory location C101H. Assume Sum to be an 8-bit No. Store Result in C204H.** **(Oct. 2013)**

Ans. :

LABEL	MNEMONICS	COMMENTS
START	LXI H, C101 H	; Set HL pointer to C101 H
	MOV C, M	; Get count in register C.
	MVI A, 00H	; Make LSBs of SUM = 00H.
	MOV B, A	; Make MSBS of SUM = 00H
	INX H	; Set HL to point the number in series
	ADD M	; Add previous No + Next No
	DAA	; Decimal adjust accumulator
	JNC AHEAD	; Is carry ? No goto AHEAD
	INR B	; Yes add carry to MSBS of sum
	DAA	; Adjust accumulator to decimal content
	DCRC	; Decrement count
	JNZ LOOP	; Is count = 0? No jump to LOOP
	STA C204H	; Store LSBS of the sum to C204 H
	MOV A, B	; Get MSBS of sum in Accumulator
	STA C205 H	; Store MSBS
END	HLT	; Stop

129) An Assembly Language Program to Find 2's Complement of five numbers stored from memory location C030H and onwards. Store the result from memory location D000H. **(Oct. 2013)**

Ans. :

LABEL	MNEMONICS	COMMENTS
START	LXI H, C030 H	; Initialize HL with first number
	LXI B, D000 H	; Initialize BC with Destination
	MVI D, 05H	; Store count in reg. D
LOOP	MOV A, M	; Get the number in Accumulator
	CMA	; One's complement of No. in A.
	INR A	; 2's complement of No. in A.
	STAX B	; Store 2's complement at address pointed by BC pair.
	INX H	; Increment HL pair
	INX B	; Increment BC pair
	DCR D	; Decrement count in reg. D
	JNZ LOOP	; Is count zero ? No jump to LOOP
END	HLT	; Stop

130) Write ALP to store 00H in register B only if the contents memory location 201FH are odd. Otherwise store EEH in register B. **(March 2014)**

Ans. :

LABEL	MNEMONICS	COMMENTS
START	MVI B, EE H	; Assume no. is even i.e. B = EEH
	LDA 201F H	; contents of 201F H are loaded in A
	RRC	; Rotate right to check LSB for ODD or EVEN
	JNC END	; If No. is EVEN then go to END
	MVI B, 00H	; Store 00H in B for ODD No.
END	HLT	; Stop

131) Write ALP to find largest element in a memory block from D000H to D00FH. Store largest number at memory location C500H. **[March 2014]**

Ans. :

LABEL	MNEMONICS	COMMENTS
START	LXI H, D000H	; Set HL pair at starting address
	MVI C, 0FH	; Reg C used as loop counter
	MOV A, M	; Contents of memory are coupled to A.
UP	INX H	; Go to next address
	CMP M	; Compare (A) and (H) (L)
	JC DOWN	; If carry = 1 i.e. (A) <(H) (L) then goto DOWN
	MOV A, M	; Move largest no. to A.
DOWN	DCR C	; Decrement loop counter by one
	JNZ UP	; Jump to UP until counter becomes zero
	STA C500H	; Store /largest no. at C500 H
END	HLT	; stop

132) Write ALP to add all the BCD numbers in a block from 2001H To 2009H. Store SUM at memory location 2000AH. [Assume SUM is 8 bit] **[March 2014]**

Ans. :

LABEL	MNEMONICS	COMMENTS
START	LXI H, 2001 H	; Point HL pair at starting address 2001H
	MVI C, 09 H	; Reg.C as counter
	XRA A	; Clear A
UP	ADD M	; (A) + (H) (L) → A
	DAA	; Decimal adjust accumulator for BCD addition
	INX H	; Increment HL pair

LABEL	MNEMONICS	COMMENTS
	DCR C	;Decrement Loop counter
	JNZ UP	; Go up until c = 0
	STA 2000H	; Store BCD sum at 2000H
END	HLT	; Stop

133) Write ALP to find SUM of a number and its reverse which is stored at memory location 2080H. Store SUM at 2081H **(March 2014)**

Ans. :

LABEL	MNEMONICS	COMMENTS
START	LDA 2080H	; Load A with contents of 2080 H
	MOV B, A	; Copy A to reg. B
	RRC	
	RRC	Rotate 4 times Right to obtain reverse of a no.
	RRC	
	RRC	
	ADDB	; Add A & B
	STA 2081 H	; Store sum at 2081 H
END	HLT	

134) Write ALP to count total number of occurrences of data 9CH in a memory block of length 16 byte, starting from 1000H. Store count in Register E. **(March 2014)**

Ans. :

LABEL	MNEMONICS	COMMENTS
START	LXI H, 1000H	; Point HL pair at starting address
	MVI C, 10 H	; Register C used as counter
	MVI E, 00H	; E = 00H
	MVIA, 9CH	; Load A with 9CH
UP	CMPM	; Compare A = 9CH with contents of memory
	JNZ DOWN	; If contents are not same then jump to DOWN
	INR E	; Increment E by one
	INX H	; Go to next address
DOWN	DCR C	; Decrement counter
	JNZ UP	; Jump to UP until count = 0
	HLT	

135) Write ALP to copy 10 consecutive bytes from memory 2025H to memory locations BCBCH onwords. **(March 2014)**

Ans. :

LABEL	MNEMONICS	COMMENTS
START	LXI H, 2025 H	; point HL pair at starting address
	LXI B, BCBC H	; BC pair point at destination address
	MVI D, 0AH	; Register D used as counter

LABEL	MNEMONICS	COMMENTS
BACK	MOV A, M	; (HL) → (A)
	STAXB	; (A) → (B) (C)
	INX H	; Go to next address (source)
	INX B	; Next destination address
	DCR D	; Decrement loop counter by 1
	JNZ BACK	; Jump back until D = 0
	HLT	; Stop

136) Write a program in assembly language to multiply two 8 bit data, where multiplier is stored at D000H and multiplicand is stored at D001H memory locations. Store the 16 bit product from memory location D002H. **(Oct. 2014)**

Ans. :

Label	Mnemonics	Comments
	MVI B , 00 H	; Move 00H to B
	LXI H , D000H	; Load HL with D000H
	MOV C, M	; Move M to C
	MVI A , 00H	; Move 00 H to A
	INX H	; Increment HL Pair
LOOP 2	ADD M	; ADD M with A
	JNC LOOP1	; Jump if No carry to
	INR B	; Increment B
LOOP 1	DCR C	; Increment C
	JNZ LOOP2	; Jump if No Zero
	INX H	; Increment HL
	MOV M, B	; Move B to M
	INX H	; Increment HL
	MOV M, A	; Move A to M
	HLT	; Stop.

137) Give the proper comments to following program. Also write the purpose of program : **(Oct. 2014)**

Label	Mnemonics	Comments
	MVI C, 0AH	; Move Immediate data 0A to C reg.
	MOV A, C	; Move C to A reg.
	RRC	; Rotate Acc.(Accumulator) right by 1 bit

Label	Mnemonics	Comments
	MOV C, A	; Move A to C reg.
	LXI H, D001H	; Load HL with D001
	LXI D, D00AH	; Load DE with D00A
L1	LDAX D	; Load Acc with M whose address is in HL
	MOV B, M	; Move the contents of Memory location whose Address is in HL to B
	XCHG	; Exchange HL with DE
	MOV M, B	; Move B to Memory
	STAX D	; Store Accumulator to Memory
	XCHG	; Exchange HL with DE
	INX H	; Increment HL
	DCX D	; Decrement DE
	DCR C	; Decrement C
	JNZ L1	; Jump if No Zero to L1
	HLT	; Stop

138) There is block of memory, from 2501H to 250AH. Write a program to replace the odd numbers with data 'FFH' in given block. **(Oct. 2014)**

Ans. :

Label	Mnemonics	Comments
	MVI C, 0A H	; Move Immediate 0A to C
	LXI H, 2501 H	; Load HL with 2501 H
L2	MOV A, M	; Move M to Accumulator
	RRC	; Rotate Accumulator Right
	JNC L1	; Jump if no carry to L1
	MVI M, FF H	; Move Immediate FF to M
L1	INX H	; Increment Hl
	DCR C	; Increment C
	JNZ L2	; Jump if No Zero to L2
	HLT	; Stop

139) Write a program in assembly language to exchange the nibbles of each memory location contents of a block which begins from 2501H, the length of block is at 2500H. Store the result at same memory locations. **(Oct. 2014)**

Ans. :

Label	Mnemonics	Comments
	LXI H, 2500 H	; Load HL with 2500 H
	MOV C, M	; Move M to C
L1	INX H	; Increment HL by 1
	MOV A, M	; Move M to Accumulator
	RRC	
	RRC	; Rotate Accumulator Right by 1 bit four times
	RRC	
	RRC	
	MOV M, A	; Move A to Memory
	DCR C	; Decrement C by 1
	JNZ L1	; Jump if No Zero to L1
	HLT	; Stop

140) Write a program to check, weather 2 Hex digits stored at D000H are same or not. If digits are same then memory location D001H should contain 00H else FFH.

(Oct. 2014)

Ans. :

Label	Mnemonics	Comments
	LXI H,D000H	; Load HL with D000 H
	MOV A, M	; Move M to Accumulator
	ANI OF H	; AND Immediate with Acc.
	MOV B. A	; Move A to B
	MOV A, M	; Move M to Acc
	ANI F0 H	; AND Immediate with Acc.
	RRC	
	RRC	; Rotate Acc. Right by 1 bit four times
	RRC	
	RRC	
	CMP B	; Compare B with Acc.
	JZ L1	; Jump if Zero to L1
	INX H	; Increment HL
	MVI M, FF H	; Move Immediate FF to M
	JMP L2	; Jump to L2
L1	INX H	; Increment HL
	MVI M, 00 H	; Move Immediate 00 H to M
L2	HLT	; Stop

141) Write a program in assembly language to add 3 byte number stored form D000H with another 3 byte number stored from D100H memory address. Store the 3 byte result from memory location D200 starting with lower byte. **(Oct. 2014)**

Ans. :

Label	Mnemonics	Comments
	LDA D000H	; Load Acc. with D000 H
	LXI H, D100 H	; Load Hl with D100 H
	ADD M	; Add M with Acc.
	STA D200 H	; Store Acc. to D200 H
	LDA D001 H	; Load Acc. with D001 H
	LXI H, D101 H	; Load HL with D101 H
	ADC M	; Add M to Acc. with carry
	STA D201 H	; Store Acc. to D201 H
	LDA D002 H	; Load Acc. with D002 H
	LXI H, D102 H	;Load HL with D102 H
	ADC M	; Add M to Acc. with carry
	STA D202 H	; Store Acc. to D202 H
	HLT	; Stop

Imagined Output will be

D000 H	02	D100 H	02	D200 H	04
D001 H	06	D101 H	05	D201 H	0B
D002 H	03	D102 H	02	D202 H	05

142) Write an assembly language program to multiply the content of 2000H by the content of 2000H. store the 16 bit result in the memory location 2010H and 2011H. **(Oct. 2015)**

Ans. :

Label	Mnemonics Operand	Comments
	XRA A	; Initialize accumulator with 00H
	MOV B, A	; Initialize register B with 00H
	LXI H, 2000H	; Initialize H-L Pointer to address 2000H
	MOV C, M	; Get first number in register C
	INX H	; Get address of second number in H-L pair
VY	ADD M	; Add two numbers
	JNC XX	; Is carry ? No – Jump to label XX
	INR B	; Increment count in register B by 1 to store MSB

Label	Mnemonics Operand	Comments
XX	DCR C	; Decrement count in register by 1
	JNZ YY	; Is zero? No – Jump to label yy
	STA 2010H	; If yes, store LSB of product at 2010H
	MOV A, B	; Get MSB in register A
	STA 2011H	; Store MSB of product at 2011H
	HLT	; Stop processing

143) Write an assembly language program to add the four byte number starting from C000H with another four byte number starting from C100H. Store the four byte result starting from C200H and carry at C204H. **(Oct. 2015)**

Ans. :

Label	Mnemonics Operand	Comments
	LXI SP, FF00H	; Initialize stack pointer
	LXI H, C100H	; Address of LSB of 2nd number
	LXI B, C000H	; Address of LSB of 1st number
	LXI D, C200H	; Address of LSB of Sum
	STC	; Set carry flag
	CMC	; Reset carry flag
	XTHL	; Save the H-L pair in stack
	LXI H, 0004H	; Byte count in reg. L
BACK	XTHL	; Save count in stack and retrieve HL pair
	LDAX B	; Get byte of 1st number of accumulator
	ADC M	; Addition of byte of 1st and 2nd number
	STAX D	; Store the sume of byte in Memory
	INX H	} Get address of next memory locations
	INX D	
	INX B	
	XTHL	; Save H-L pair in stack and retrieve the count
	DCR L	; Decrement count by 1
	JNZ BACK	; Is all bytes are added if no-jump to Label BACK
	MVI A, 00H	; If yes, clear the accumulator
	RAL	; Get carry in accumulator
	STAX D	; Store carry bit in memory
	HLT	; Stop processing

144) Write an assembly language program to count the odd numbers in a memory block starting from 2300H to 2320H. Store the count at memory location 2400H. (Oct. 2015)

Ans. :

Label	Mnemonic operand	Comments
	MVI C, 21H	; Place the count in register C
	XRA A	Initialize the register B = 00H
	MOV B, A	
	LXI H, 2300 H	; Initialize H-L pair
Loop 2	MOV A, M	; Get the number in A
	RRC	; Rotate the accumulator to right
	JNC LOOP1	; Is number is odd ? No – jump to label loop 1
	INR B	; Yes, increment count
Loop 1	INX H	; Address of next number
	DCR C	; Decrement test count
	JNZ Loop2	; Is zero ? No – Jump to label loop2
	MOV A, B	; Get count of odd no. in accumulator
	STA 2400H	; Store the count. In memory 2400H
	HLT	; Stop processing

145) The two memory block starts from 3000H and 3100H each containing 16 bytes. Write an assembly language program to exchange the content of these blocks. (Oct. 2015)

Ans. :

Label	Mnemonic operand	Comments
	MVI C, 10H	; Get count in register C
	LXI H, 3000H	; Address of first block in HL pair
	LXI D, 3100H	; Address of second block in D-E pair
REP	MOV B, M	; Get number form first block in reg. B.
	LDAX D	; Get number from second block in accumulator
	MOV M, A	; Store the number in first block
	MOV A, B	; Get the number of first block in accumulator
	STAX D	; Store the number in second block
	INX D	Get address of next number
	INX H	
	DCR C	; Decrement count by 1
	JNZ REP	; Is zero? No-jump to label REP
	HLT	; Yes, stop processing

146) A memory block from 4000H containing 16 hexadecimal numbers. Write an assembly language program to count the numbers which has identical nibbles. Stores to count in memory location 4010H. **(Oct. 2015)**

Ans. :

Label	Mnemonics operand	Comments
	MVI B, 00H	; Initialize register B as counter
	MVI C, 10H	; Initialize test count with 10H
	LXI H, 4000H	; Initialize H-L pair by 4000H
YY	MOV A, M	; Get the number in accumulator
	RRC	
	RRC	Exchange the nibble of the number
	RRC	
	RRC	
	CMP M	; Compare with original number
	JNZ XX	; Is zero? No-jump to label XX
	INR B	; Increment count by 1
XX	INX H	; Get address of next number
	DCR C	; Decrement test count
	JNZ YY	; Is zero? No-Jump to label YY
	MOV A, B	; Yes, get count in accumulator
	STA4010H	; Store the count in memory
	HLT	; Stop processing

147) Write an assembly language program to test weather the data DCH is present in the memory block which starts from 2000H. If the data is present in block the HL pair should contain its address otherwise it should contains FFFFH. **(Oct. 2015)**

(Test for the first occurrence only)

Ans. :

Label	Mnemonics Operand	Comments
	MVI B, 10H	; Get test count in register B
	MVI A, DCH	; Number to be tested in accumulator
	LXI H, 2000H	; Initialize H-L pair with 2000H
YY	CMP M	; Check the number with DCH
	JZ XX	; Is number DCH of Yes, Jump to label XX
	INX H	; No, get address of next number
	DCR B	; Decrement count by 1
	JNZ YY	; Is zero? No. Jump to Label YY.
	LXI H, FFFFH	; Get FFFFH in H-L pair since no, is not found.
XX	HLT	Stop processing

148) Write an Assembly Language Program to multiply a number stored at location 1050 with a number at location 1051. Result is 2-byts. Stored result at locations 1052 and 1053. (March 2016)

Ans. :

Label	Mnemonics	Comments
	MVI D,00	; D = 00H
	LXI H, 1050	; set H-L Pointer to 1050 H
	MOV B, M	Take no in B xg
	INX H	; Increment HL contents
	MOV C, M	; take no in C Reg
	MVI A, 00	; clear accumulator
UP	ADD C	; ADD C reg with A reg
	JNC Dn	; Addition carry stored in D reg
Dn	DCR B	; Decrement B reg.
	JNZ UP	; Jump if not zero go to label UP
	INX H	; Increment HL contents
	MOV M, A	; move acc content to mem by 1
	INX H	; Increment HL content by 1
	MOV M, B	; store result in 1053 H
	HLT	; stop

149) Write an Assembly Language Program to transfer a block memory starting from 1050H to 1059H to a new location starting from 1070H to 1079H. (March 2016)

Ans. :

Label	Mnemonics	Comments
	LXI H, 1050 H	: Set HL to 1050 H
	LXI D ,1070 H	: Set DE to 1070 H
	MVI B, 0A	: Set count B = 0AH
UP	MOV A, M	: get source from memory
	STAX D	: load destination block in Acc
	INX H	: Increment HL pair
	INX D	: increment DE pair
	DCR B	: decrement count & check
	JUZ up	Whether it is zero or not?
	HLT	: Stop

150) A two byte number is stored at location C000 H and C001 H. Write on Assembly Language Program to rotate this number to left side by 3 Places and stored the rotated number in BC register pair. **(March 2016)**

Label	Mnemonics	Comment
	LHLD C000	; Get no in HL pair
	MVI C, 03	; Get 3 in c reg
UP	DAD H	; Rotate number to left side by 3 places
	JNC dn	; Jump if no carry go on label dn
	INR L	; Increment reg 1
dn	DCR C	; Decrement c reg
	JNZ Up	; Jump if not zero go on label Up
	MOV B, H	; store no in BC reg pair
	MOV C, L	

151) Write an Assembly Language program to add 2 decimal numbers stored at 1050 H and 1051 H. Stored result at 1052 H and 1053 H. **(March 2016)**

Ans. :

Label	Mnemonics	Comments
	LX1 H, 1050 H	; set HL pointer to 1050 H
	MOV A, M	; store 1st no in A reg
	INX H	; point HL pair to 2nd no
	MVI C, 00	; move 00 data into C reg.
	ADDM	; Add two numer
dn	DAA	; Decimal adjust accumulator
	JNC DN	; Jump if no carry go on label DN
	INR C	; If carry increment MSB in C reg
dn	INX H	; Increment HL by 1
	MOV M, A	; Get LSB in 1052 H
	INX H	; Increment HL by 1
	MOV M, C	; Get MSB in 1053 H
	HLT	; Stop

152) Write an Assembly Language Program to increment the contents of alternate memory locations each by two from 1051 H to 1060 H. **(March 2016)**

Ans. :

Label	Code	Comments
	MVI C, 08 H	: set C = count = 08 H
	LXI H, 1050 H	: set HL with 1050 H
UP :	INR M INR M	: Increment memory contents by 2
	INR H INX H	: Increment HL pair two times
	DCR C	: Decrement count C
	JNZ up HLT	: Go to Increment memory if count is not zero ?

153) **A memory block starts from C301 H and its block length count is stored at C300 H. Write an assembly language program to count the even numbers and odd numbers present in the block. Store the even number count at C400H and odd number count at C401 H.** **(June 2016)**

Ans. :

LABEL	MNEMONICS	COMMENTS
	MVI B, 00H.	; Initialized B reg. Content to zero.
	MVI D, 00H	; Initialized D reg. Content to zero.
	LXI H, C300H	; Set H-L pair to C300H.
	MOV C, M	; Get count i.e. Length in reg. C.
	INX H	; Increment H-L pair by 1.
LOOP2	MOV A, M	; Get number from memory to accumulator.
	RRC	; Rotate acc. content right to determine odd/even.
	JC Loop 1	; If carry? jump on Loop 1.
	INR B	; Yes Increment B reg. content by 1.
	JMP Next	; Unconditional jump to Next.
Loop 1	INR D	; Increment D reg. Content by 1.
Next	INX H	; Increment H-L reg. pair by 1.
	DCR C	; Decrement C reg. by 1.
	JNZ LOOP2	; Jump if not zero? Jump on LOOP2.
	MOV A, B	; Move B reg. content to accumulator
	STA C400H	; Store accumulator content at C400H memory location.
	MOV A, D	; Move D reg content to accumulator
	STA C401H	; Store accumulator content at C401H memory location.
	HLT	; Stop microprocessor.

154) **Write a Assembly Language Program to copy a block of data having starting address 4500 H to new location starting from 4600 H. The length of block is stored at memory location 44FF H.** **(March 2017)**

Ans. :

Label	Mnemonics and Operand	Comments
	LX1 H, 44 FFH	; Set HL with 44FFH.
	MOV C, M	; Store count in C reg
	LXI D, 4600 H	; Set DE with 4600H
Loop	INX H	; Incr. HL by 1
	MOV A, M	; Copy mem content to A
	STAX D	; Store Acc to mem with Add of DE
	INX D	; Incr. DE by 1
	DCR C	; Decr. C by 1
	JNZ Loop	; if c ≠ 0 then go to Loop
	HLT	; Stop

155) Write an Assembly Language Program to add two 8-bits BCD numbers stored at memory location 4500 H and 4501 H. Store the two byte BCD result from memory location 4502 H onwards. (March 2017)

Ans. :

Label	Mnemonics and Operand	Comments
	MVI B, 00	; Store 00 in B reg
	LXI H, 4500 H	; Set HL with 4500 H
	MOV A, M	; Copy mem content to A
	INX H	; Incr. HL by 1
	ADD, M	; Add Acc with mem
	DAA	; Convert Hex to BCD
	JNC next	; if cy = 0 then go to next
	INR B	; Incr. B by 1
next	STA 4502 H	; Store Acc to 4502H
	MOV A, B	; Copy B to A
	STA 4503H	; Store Acc to 4503H
	HLT	; Stop

156) Write an Assembly Language Program to fill the memory locations 4500 H to 4504 with the Hexadecimal numbers 09 H to ODH respectively. (March 2017)

Ans. :

Label	Mnemonics and Operand	Comments
	MVI C, 05H	; Store 05 in C reg.
	MVI A, 09H	; Store 09 in Acc.
	LXI H, 4500 H	; Set HL with 4500 H
Loop	MOV M, A	; Copy Acc to Memory
	INX H	; Incr. HL by 1
	INR A	; Incr. Acc. By 1
	DCR C	; Decr. C by 1
	JNZ Loop	; if c ≠ 0 then go to Loop
	HLT	; Stop

157) Write an Assembly Language Program to exchange the nibbles o8-bit number stored in memory location 4500H. Store the result at memory location 4501H. (March 2017)

Ans. :

Label	Mnemonics and Operand	Comments
	LXI H, 4500 H	; Set HL with 4500 H
	MOV A, M	; Copy mem. To Acc.
	RRC	; Rotation right 4 time to
	RRC	; exchange nibbles
	RRC	;
	RRC	;
	STA 4501 H	; Store Acc to 4501 H
	HLT	; Stop

158) A block of data is stored in memory location 4500 H. The length of block is stored in memory location 44FFH. Write an Assembly Language Program that searches for the first occurrence of data D9H in given block. Store the address of this occurrence in H.L. pair. If the number is not found then HL pair should contain 5000 H. (March 2017)

Ans. :

Label	Mnemonics and Operand	Comments
	LXI H, 44FF H	; Set HL with 44FFH
	MOV C, M	; Copy mem. to C
	MVI A, D9H	; Store D9 to Acc.
Loop	INX H	; Incr. HL by
	CMP M	; Compare Acc. to mem.
	JZ STOP	; Go to STOP if Z = 1
	DCR C	; Decr. C by 1
	JNZ Loop	' go to Loop if c ≠ 0
	LXI H, 5000 H	; Set HL with 5000 H
STOP	HLT	; Stop

159) **A block of data is stored from memory location 4501H and onwards. The length of the block is stored at memory location 4500H. Write an Assembly Language Program to find the sum of block of data. Store the two byte result from memory location 4600.** **(March 2017)**

Ans. :

Label	Mnemonics and Operand	Comments
	LXI H, 4500 H	; Set HL with 4500 H
	MOV C, M	; Copy mem. to C
	MVI A, 00H	; Store A with 00
	MVI B, 00H	; Store B with 00
LOOP	INX H	; Incr. HL by 1
	ADD M	; Add mem. with Acc.
	JNC next	; if cy = 0 go to next
	INR B	; Incr. B by 1
STOP	DCR C	; Decr. C by 1
	JNZ LOOP	; if Z = 0 go to LOOP
	STA 4600 H	; Store Acc. To 4600 H
	MOV A, B	' Copy B to A
	STA 4601 H	; Store Acc. To 4601 H
	HLT	; Stop

160) **Write an Assembly Language Program to separate the two nibbles of an 8-bit number stored at 7501H. Store the low-order nibble and high-order nibble, respectively, at the locations 7502H and 7503H.** **(July 2017)**

Ans. :

LXI H 7501 H	; Load HL reg. pair with 7501H mem.
MOV A, M	; Move mem content to accumulator.

MOV B, M	; move mem content to reg. B.
ANI, 0FH	; AND immediately 0FH with accumulator content.
MOV C, A	; move accumulator content to reg. C.
MOV A, B	; move B reg. content to accumulator.
ANI F0H	; AND immediately F0H with accumulator content.
MOV D, A	; move accumulator content to reg. D.
INX H	; Increment HL reg. pair by 1 mem. location.
MOV M, C	; move reg. C content to mem.
INX H	; increment ent. HL reg. pair by 1 men location.
MOV M, D	; move reg. D content to mem.
HLT	; Stop the microprocessor.

161) Write ALP to multiply number stored at 8085H by 09H and store result at 8086 H and 8087 H, with lower byte at 8086H. (March 2015)

Ans. :

Label	Mnemonics	Comments
	LDA 8085 H	; Load 8085 in A reg
	MOV E, A	; Move A to E
	MVI D, 00 H	; Higher byte of DE pair is 00 H
	LXI H, 0000 H	; clear HL pair
	MVI C, O9 H	; C used as counter , C = 9 H
BK	DAD D	;(DE) + (HL) = (HL)
	DCR C	;Decrement counter by 1
	JNZ BK	;Jump to BK until counter becomes zero
	SHLD 8086	; Store result at 8084 and 8087
	HLT	; stop

162) Write ALP to find 2's complement of a 16 bit number stored in DE pair. Store result in HL pair. (March 2015)

Ans. :

Label	Mnemonics	Comments
	MOV A, E	; Move E reg. Content to accumulator
	CMA	; Complement lower byte of 16 bit number
	MOV E, A	; Move Accumulator content to reg. E
	MOV A, D	; Move reg. D content to accumulator
	CMA	; Complement Higher byte of 16 bit number
	MOV D, A	; Move accumulator content to reg. D
	INX D	; Add one to get 2's complement
	XCHG	; Store result in HL Pair
	HLT	; stop

163) Locate smallest number in a block from 2050 H to 2060H and store it in memory location 2061 H. **(March 2015)**

Ans. :

Label	Mnemonics	Comments
	LXI H, 2050 H	; HL pair at starting address
	MVI C, 10 H	; Reg C as Counter
	MOV A, M	; Move contents of memory to Acc.
UP	INX H	; Next Address
	CMP M	; Compare A to Memory
	JC DOWN	; Is no. in A is smaller ? Yes then jump to DOWN
	MOV A, M	; NO, bring smaller no. in A
DOWN	DCR C	; Decrement Count
	JNZ UP	; Count = o ? No Jump to UP
	STA 2061 H	; Store Smallest at 2061 H
	HLT	; Stop

164) Write ALP to store data BCH in 20 continuous memory locations starting from 8081 H. **(March 2015)**

Ans. :

Label	Mnemonics	Comments
	LXI H, 8081 H	; Set HL pair at Starting Address
	MVI C, 14 H	; Reg. C as counter
UP	MVI M, BC H	; Move data BC to Memory
	INX H	; Go to next Address
	DCR C	; Decrement C by 1
	JNZ UP	; Jump to UP until counter becomes zero
	HLT	; Stop

165) Write ALP to divide number at 6068H by a non-zero number at 6067 H. Store quotient at 6069H and remainder at 606AH. **(March 2015)**

Ans. :

Label	Mnemonics	Comments
	LXI H, 6067 H	; Load HL with 6067 H
	MOV B, M	; Move M to B
	INX H	; Increment HL
	MOV A, M	; Copy dividend to Acc.
	MVI C, 00 H	; Clear Reg. C to store quotient

Label	Mnemonics	Comments
UP	CMP B	; Compare dividend and divisor
	JC DOWN	; if dividend < divisor ? Yes then go to DOWN
	SUB B	; dividend = dividend - divisor
	INR C	; Increment quotient by 1
	JMP UP	; Jump to UP
DOWN	STA 6069 H	; Store remainder in Acc at 6069 H
	MOV A, C	; copy quotient to Acc.
	STA 606A H	; Store quotient in Reg. C at 606A H
	HLT	; stop

166) **Write ALP to clear register B, if number at memory location 20F9H is palindrome; otherwise store FFH in register B.** **(March 2015)**
[Palindrome No. Ex. FF, 22, AA]

Ans. :

Label	Mnemonics	Comments
	MVI B, FF H	; Assume Number is not palindrome
	LDA 20F9 H	; Take no. in Acc.
	MOV C, A	; Store no. in C reg.
	RRC	
	RRC	; Rotate 4 times right to get reverse of a number
	RRC	
	RRC	
	CMP C	; compare reverse and original number
	JNZ DOWN	; Are they same ? No then Jump to DOWN
	MVI B, 00 H	; Yes Number is palindrome store 00 H in B
DOWN	HLT	; stop

167) **Write an Assembly Language Program to fill the memory block stored from 7601H to 760FH with the data OOH and FFH alternatively.** **(July 2017)**

Ans. :

Label	Mnemonics	Comments
	MVI C, 0FH	; Initialize counter
	MVI D, 00H	; Move 00 to D register
	MVI E, FFH	; Move FF to E register
	LXI H, 7601H	; Initialize pointer
UP	MOV M, D	; Fill 00 in memory location

Label	Mnemonics	Comments
	DCR C	; Decrement counter
	INX H	; Increment pointer
	MOV M, E	; Fill FF in memory location
	INX H	; Increment pointer
	DCR C	; Decrement counter
	JNZ UP	; Check if counter ≠ 0, jump on UP
	HLT	; Stop processing

168) **Write an Assembly Language Program to search the data byte A4H in a memory block stored from 9901H to 990AH. If the search is successful, the HL register pair should contain the address of the location where the specified data byte is found; else, the HL pair should contain 0000H.** **(July 2017)**

Ans. :

Label	Mnemonics	Comments
	LXI H, 9900H	; Load HL pair with 9900H
	MOV C, M	; Move count in Reg. C
	MVI A, A4H	; Set accumulator = A4H
LOOP	INX H	; Increment HL pair
	CMP M	; Compare memory and accumulator
	JZ BACK	; If memory location in block = A4, then jump
	DCR C	; Decrement count
	JNZ LOOP	; Repeat if count ≠ 0
	LXI H, 0000H	; Set HL pair to 0000H if number found
	HLT	; Stop processing

169) **Write an Assembly Language Program to take the sum of the 8-bit contents of a memory block stored from 2201H to 220AH. Stoe the 2-byte result at the locations 220BH and 220CH starting with LOB (Lowers Order Byte).** **(July 2017)**

Ans. :

Label	Mnemonics	Comments
	LXI H, 2201H	; Set HL pointer to 2201H
	MOV C, 0AH	; Store count OA to Reg. C
	MVI A, 00H	; Make LSBs of SUM = 00H
	MOV B, A	; Make MSBs of SUM = 00H
BACK	ADD M	; Add accumulator content with memory

Label	Mnemonics	Comments
	JNC LOOP	; Jump if no carry jump on LOOP
	INR B	; Increment B reg. content by 1
LOOP	INX H	; Increment memory location
	DCR C	; Decrement counter by 1
	JNZ BACK	; Jump if not zero jump on BACK
	STA 220BH	; Store LSBs of the sum to 220BH
	MOV A, B	; Get MSBs of sum in accumulator
	STA 220CH	' Store MSB at 220CH
	HLT	; Stop processing

170) Write an Assembly Language Program to count the total number of O (Low) bits in an 8-bit number stored at the location 4301H. Store the result (count) at the memory location 4302H. **(July 2017)**

Ans. :

Label	Mnemonics	Comments
	LXI H, 4301H	; Initialize HL pair with address of number
	MOV B, M	; Get number in B Reg.
	MVI C, 00H	; Initialize reg. C to store count of zeros
	MVI E, 08H	; Initialize reg. E to store count for 8 bit no.
BACK	MOV A, B	; Transfer 8-bit number into accumulator
	RLC	; Rotate content of accumulator left side by 1 bit
	MOV B, A	; Store the rotated data in reg. B
	JC LOOP	; If carry ? yes jump to LOOP
	INR C	; Increment reg. C content by 1 if there is no carry bit
LOOP	DCR E	; Decrement reg. E by 1
	JNZ BACK	; Jump if not zero jump to BACK
	MOV A, C	; Get answer i.e. number of zero's to accumulator
	STA 4302H	' Store the count in 4302H memory location
	HLT	; Stop processing

171) Write an Assembly Language Program to find the greates1 number in a memory block stored from 6201H to 620AH. Store the result at the location 620BH. **(July 2017)**

Ans. :

Label	Mnemonics	Comments
	MVI A, 00H	; Largest = 00H
	MVI C, 0AH	; Set count = 0AH
	LXI H, 6201H	; Set HL pair to 6201H
BACK	CMP M	; Compare with previous no. ? Is it greater
	JNC LOOP	; No larger is in accumulator go to LOOP
	MOV A, M	; get larger no. in accumulator
LOOP	INX H	; Increment next memory location
	DCR C	; Decrement counter
	JNZ BACK	; Repeat if counter ≠ 0
	MOV M, A	; Store largest no. in memory location 620BH
	HLT	; Stop processing

172) Write an Assembly Language Program to multiply an 8-bit number stored at 4301H by another 8-bit number stored at 4302H. Store the result at the location 4303H and 4304H beginning with LOB (Lower Order Byte) **(March 2018)**

Ans. :

Label	Mnemonics	Comments
	LXI D, 4301 H	; Load multiplier and multiplicand in L and H
	XCHG	; Place multiplier and multiplicand in E and D
	LXI H, 0000 H	; Clear HL register pair to store 16-bit product
	MOV A, D	; Take multiplier in A
	MVI D, 00 H	; Clear the D register
BACK :	DAD	; Add DE pair to HL pair
	DCR A	; Decrement multiplier count
	JNZ BACK	; If counter ≠ 0, jump label "BACK"
	SHLD 4303 H	; Store the LOB and HOB of product at 4303H and 4304H
	HLT	; Stop the processing

173) Write an Assembly Language program to fill in the memory locations starting from 6900H and onward with the decimal numbers 0 to 99. **(March 2018)**

Ans. :

Label	Mnemonics	Comments
	LXI H, 6900 H	; Initialize the first-memory location
	MVI C, 64 H	; Initialize register C as a location counter
	XRA A	; Clear the accumulator

Label	Mnemonics	Comments
REPEAT	MOV M, A	; Move accumulator contents to memory
	ADI 01 H	; Update the contents of accumulator
	DAA	; Convert binary contents of accumulator into decimal
	INX H	; Get the next memory location
	DCR C	; Decrement location counter by 1
	JNZ REPEAT	; If counter ≠ 0 jump to the label "REPEAT"
	HLT	; Stop the process

174) Write an Assembly Language Program to take the 2's complement of an 8-bit number stored at 3301H. Store the result at the memory location 3302H. (March 2018)

Ans. :

Mnemonics	Comments
LXI H, 3301 H	; Point to the given 8-bit no.
MOV A, M	; Copy the number in accumulator
CMA	; Take the 1's complement
ADI 01 H	; Obtain the 2's complement
INX H	; Get the next memory location
MOV M, A	; Place the result in memory
HLT	; Stop the μp

175) Write an Assembly Language Program to count the occurrence of the data byte ACH in a memory block stored from 7401H to 7405H. Store the count at the memory location 7406H. (March 2018)

Ans. :

Label	Mnemonics	Comments
	LXI H 7401H	; initialize the first memory location
	MVI C, 00 H	; Initialize reg. C as location counter
	MVI B, 00 H	; Initialize reg. B to store occurance byte counter
BACK	MOV A, M	; Take the mem. Contents to accumulator
	CPI ACH	; Check if accumulator matches the data ACH
	JNZ SKIP	; If accumulator doesn't contain ACH, jump to skip
	INR B	; Update the value of occurance counter
SKIP	INX H	; Get the next memory location
	DCR C	; Decrement reg. C content by 1
	JNZ BACK	; If counter ≠ 0, jump to the label "BACK"
	INX H	; Get the next memory location
	MOV M B	; Place occurent count by in memory
	HLT	; Stop the processing

176) **Write a subroutine in assembly language to fill the memory locations 7301H to 73FFH with the hexadecimal numbers 01H to FFH respectively.** **[March 2018]**

Ans. :

Label	Mnemonics	Comments
FILL :	LXI H, 7301H	; Point to the first location
	MVI C, FF H	; Initialize reg. C as location counter
	MVI A, 01 H	; Initialize reg. A with 01 n content
BACK	MOV M, A	; Copy the accumulator content in memory
	INX H	; Get the next memory location
	INR A	; Increment accumulator contents by 1
	DCR C	; Decrement reg. C counter by 1
	JNZ BACK	; If counter ≠ 0, jump to the label "BACK"
	RET	; Return to main program

177) **Write an Assembly Language Program to count the total number of even data bytes occurring in a block of data stored from 9201H to 902AH. Store the result (count) at the memory location 9500H.** **[March 2018]**

Ans. :

Label	Mnemonics	Comments
	LXI H, 9201H	; Initialize the first memory location
	MVI C, 0A H	; Initialize reg. C as location counter
	MVI B, 00 H	; Initialize reg. B to store even byte counter
REPEAT	MOV A, M	; Get the memory content in accumulator
	RRC	; Take bit D_0 of accumulator in C_y flag position
	JC NEXT	; If not even jump to the label "NEXT"
	INR B	; Update the value of even byte counter
NEXT	INX H	; Get the next memory location
	DCR C	; Decrement location counter by 1
	JNZ REPEAT	; If counter ≠ 0, jump to the label "REPEAT"
	MOV A, B	; copy even byte count value in accumulator
	STA 9500H	; Store even byte count at address 9500H
	HLT	; Stop the processing

178) **Write the appropriate comment for the following program as well as its purpose.**
Note that square decimal number from 0 to 9 are stored in memory location from 1500H to 150gH respectively. The above range (0 to 9) decimal is stored at 1234H. **[July 2018]**

Label	Instruction	Comments
	LDA 1234H	; ________
	MOV L, A	; ________
	MVI H, 15H	; ________
	MOV A, M	; ________
	STA 1235H	; ________
	HLT	; ________

Ans. :

Label	Instruction	Comments
	LDA 1234H	; Load accumulator directly from 1234 H memory location
	MOV L, A	; move the content of Acc to reg. L.
	MVI H, 15H	; move immediate 15H to reg. H
	MOV A, M	; move memory content to accumulator
	STA 1235H	; store accumulator content directly at 1234 H memory location
	HLT	; Stop µp

Purpose of program to find square of given decimal number.

179) Write an Assembly Language Program to find absolute difference of two hex numbers stored in memory locations 5000H and 5001H. Store the result at 5002 H. (March 2019)

Ans. :

Label	Mnemonics	Comments
	LXI H, 5000 H	; Set H-L pointer to 5000 H
	MOV A, M	; Move 1st no. in Accumulator
	INX H	; Increment H-L pair
	SUB M	; Subtract 2nd no. form 1st no.
	JP GO	; If positive result, jump to GO
	MOV A, M	; Move 2nd no. in ACC
	DCX H	; Decrement H-L pair
	SUB M	; Subtract 1st no. from 2nd no.
GO	STA 5002 H	; Store result in 5002 H
	HLT	; Stop

180) Write an Assembly Language Program to find largest number in a block of memory starting from 7000 H. The length of the block is stored at 6FFF H. Store the result at the end of the block. **(March 2019)**

Ans. :

Label	Mnemonics	Comments
	LXI H, 6FFF H	; Set H-L pair to 6FFF H
	MOV C, M	; Set counter
	MVT A, OOH	; Set largest = OO H
BACK	INX H	; Increment H-L pair
	CMP M	; Compare no in memory with no in ACC
	JNC AHEAD	; If no in ACC is larger, jump to AHEAD
	MOV A, M	; Move larger no in ACC
AHEAD	DCR C	; Decrement counter
	JNZ BACK	; Repeat if counter≠0
	INX H	; Increment H-L pair
	MOV M, A	; Store largest number at the end of block
	HLT	; Stop

181) Study the following program and answer the questions given below : **(March 2019)**

Label	Mnemonics/Operand
	MVI C, 08 H
	LXI H, 6000 H
	MOV A, M
BACK	RRC
	DCRC
	JNZ BACK
	INX H
	MOV M, A
	HLT

(i) Write the purpose of the program.

(ii) Write comments for the instructions used in the program.

(iii) If the input data at memory location 6000 H is FF H, then write the result along with corresponding memory location.

182) A block of data is stored in memory locations starting from 3001 H. The length of the block is at 3000 H. Write an Assembly Language Program that searches for the first occurrence of data AO H in given block. Store the address of this occurrence in HL pair. If the number is not found then HL pair should contain 0000 H. **(March 2019)**

Ans. :

Label	Mnemonics	Comments
	LXI H, 3000 H	; Set H-L pair to 3000 H
	MOV C, M	; Set counter
	MVI A, AO H	; Move AO H to ACC
BACK	INX H	; Increment H-L pair
	CMP M	; Check if memory contains AO H
	JZ END	; If yes, then found
	DCR C	; Decrement counter
	JNZ BACK	; Repeat if counter # 0
	LXI H, 0000 H	; Set H-L pair to 0000 H
END	HLT	; Stop

183) Write a Assembly Language Program to find sum of ten hex numbers stored in consecutive memory locations starting from 4000 H. Store the two byte result at the end of the block beginning with lower byte. (March 2019)

Ans. :

Label	Mnemonics	Comments
	MVIC, OAH	; Set counter to OA H
	MVI A, OOH	; Initialise ACC
	MOV B, A	; Initialise reg. B
BACK	LXI H, 4000 H	; Set H-L pair to 4000 H
	ADD M	; Add contents of memory with ACC
	JNC AHEAD	; If no carry, jump AHEAD
	INR B	; Add carry to MSB of sum
AHEAD	INX H	; Increment H-L pair
	DCR C	; Decrement counter
	JNZ BACK	; Repeat if counter # 0
	MOV M, A	; Store LSB of Sum
	INX H	; Increment H-L pair
	MOV A, B	; Move contents of B to accumulator
	MOV M, A	; Store MSB of Sum
	HLT	; Stop

184) Study the following program and answer the questions given below : **[March 2019]**

Label	Mnemonics/Operand	
	LXI H, COOO H	
	MOV C, M	
BACK	INX H	
	MOV A, M	
	XRA A	
	MOV M, A	
	DCR C	
	JNZ BACK	
	HLT	

(i) Write the purpose of the program.

(ii) Write comments for the instructions used in the program.

(iii) If the input data at memory location COOO H is 05 H, then write the result along with corresponding memory location.

Ans. :

(i) Clear the memory location till counter not zero OR make the memory location with zero data.

(ii)

Label	Mnemonics/Operand	
	LXI H, COOO H	; Load in mm HL reg. with COOOH memory location
	MOV C, M	; move the content of memory location to C reg.
BACK	INX H	; Increment HL reg pair by 1 memory location
	MOV A, M	; move the content of memory location to accumulator
	XRA A	; Exclusive OR the content of accumulator
	MOV M, A	; move the content of accumulator to memory location.
	DCR C	; Decrement content of C reg by 1 memory location
	JNZ BACK	; jump if not zero jump on BACK
	HLT	; Stop μp

(iii) **If COOO H = 05 H then**

after execution COO1 H = 00 H

COO2 H = 00 H

COO3 H = 00 H

COO4 H = 00 H

COO5 H = 00 H

185) Accumulator contain data FFH and register B contain data 02H. Write the status of various flags and content of accumulator after execution of ADD B instruction. **(July 2019)**

Ans. :

ACC = FFH = 1111 1111

B = 02H = 0000 0000

```
                      1111 1111
                    + 0000 0010
After ADD Bcy  [1]    1111 11
                    -----------
                      0000 0001
```

After exec. ACC = 01

S = 0, Z = 0, AC = 1, P = 0, Cy = 1

186) The flag register of 8085 microprocessor contain data 55H. Interpret its meaning. **(July 2019)**

Ans. :

Flag Reg.= 55 H

= 0101 0101

D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0
0	1	0	1	0	1	0	1
S	Z	X	AC	X	P	X	Cy

S = 0 = Reset = Accumulator content is positive no.

Z = 1 = Set = Accumulator content result is zero

AC = 1 = Set = In accumulator content carry is generated from D_3 to D_4

P = 1 = Set = In accumulator content even no. of 1's present

Cy = 1 = Set = There is carry or borrow generated in accumulator content

187) Accumulator contain data ABH and register B contain data 55H. What will be the contents of accumulator after execution of each following instruction independently ? **(July 2019)**

(i) XRA B (ii) CMP B

(iii) ADD B (iv) CMA

A_{CC} = AB_H = 1010 1011

Reg B = 55H = 0101 0101

Ans. :

(i) XRA B : Logically X-OR with accumulator

1010 1011

0101 1110 = FE_H

After execution XRA B Acc. content = FE_H

(ii) CMP B : Compare Reg. B with accumulator.

A = 1010 1011 and B = 0101 0101

While comparing accumulator remains unchanged. Hence A = ABH.

(iii) ADD B : Add Reg. B with accumulator.

A = 1010 1011

B = 0101 0101

$\boxed{1}$ 1111 111

Cy 0000 0000 = 00H

∴ After execution ADD B Acc. content = 00H and Cy flag = 01H.

(iv) CMA : Complement content of Accumulator.

A = 1010 1011

1's complement 0101 0100 = 54H

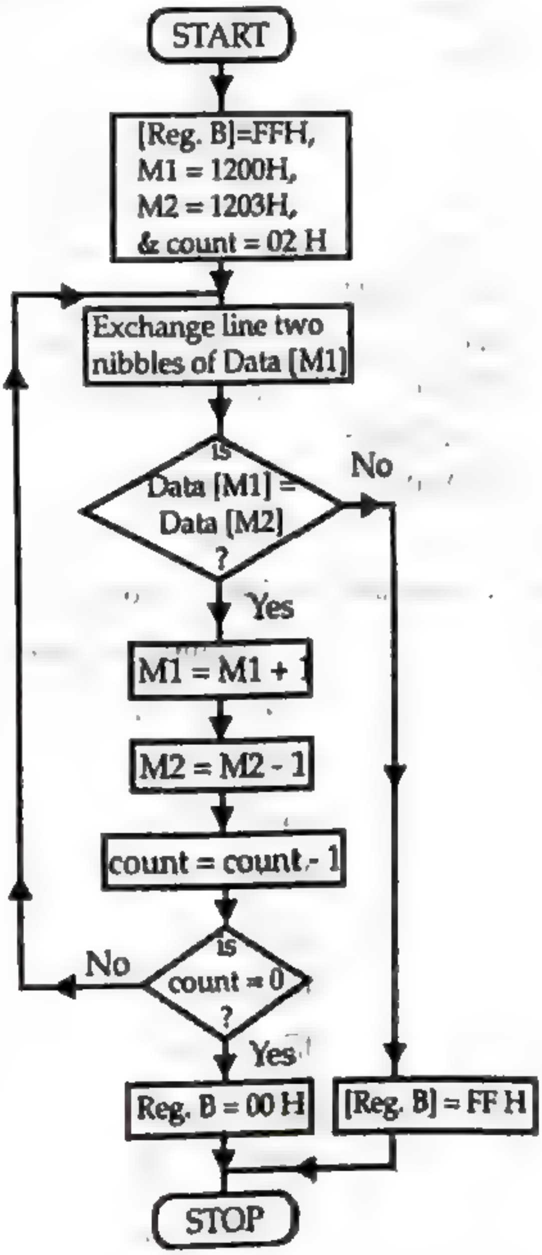
∴ After execution CMA Acc. content = 54H

---

188) **Write an Assembly Language Program to check whether the given 16 bit number stored in consecutive memory location beginning with lower byte 1200H is palindrome or not. If the number is palindrome then store FFH at 1210H memory location otherwise store OOH at same memory location.** (July 2019)

Ans. :

Flowchart :



Assembly language program :

Memory address	Label	Mnemonics	Comments
C000		LXI H, 1200 H	; Set H-L pair to 1200H
C003		LXI D, 1203H	; Set D-E pair to 1203H
C006		MVI C, 02H	; Set count = 02H
C008	Loop	MOV A, M	; take [[H-L]] in accumulator
C009		RRC	; with 4 RRC
C01A		RRC	; exchange the
C00B		RRC	; two nibbles of
C00C		RRC	; no. in accumulator
C00D		XCHG	; Exchange [H-L] & [D-E]
C00E		CMP M	; is [Acc.] = [[H-L]] ?
C00F		JNZ Escape	; escape if [Acc.] ≠[[H-L]]
C012		XCHG	; Reexchange [HL] & [DE] pairs
C013		INX H	; [H-L] = [H-L] + 1
C014		DCX D	; [D-E] = [D-E] - 1
C015		DCR C	; count = count - 1
C016		JNZ Loop	; Repeatif count ≠ 0
		LXI H, 1210H	
C019		MVI B, FFH	; Set [Reg. B] = 00
C01B		JMP STP	if No. is palindrome.
		LXI H, 1210H	
C01E	Escape	MVI B, 00H	; Number is not palindrome
C020	STP	HLT	; stop

189) Study the given program and answer the questions given below : (July 2019)

Label	Mnemonics/Operand
	MVI B, 0A H
	LXI H, 2000 H
	MVI A, 01H
loop	MOV M, A
	INX H
	DCR B
	JZ stop
	ADI 02H
	JMP loop
stop	HLT

(i) Write the purpose of the program.

(ii) Write comments for each instructions used in the program.

(iii) Write the result along with their corresponding memory locations.

Ans. :

(i) Purpose of program to store ten add no. in series.

(ii)

	MVI B, 0AH	; initialize 0AH data to reg. B
	LXI H, 2000H	; Load HL reg. Pair with 2000H m.L.
	MVI A, 01H	; initialize 01H data to reg. A
loop	MOV M, A	; move reg. A data to memory
	INX H	; Increment HL reg. pair by 1 m.L.
	DCR B	; Decrement reg. B content by 1
	JZ Stop	; Jump if zero jump on specify label
	AD1 02H	; Add immediate 02H data with accumulator
	JMP loop	; Jump unconditionally to specify lable
Stop	HLT	; Stop

(iii)

2000 = 01H	2005 = 0BH
2001 = 03H	2006 = 0DH
2002 = 05H	2007 = 0FH
2003 = 07H	2008 = 11H
2004 = 09H	2009 = 13H

190) Write an Assembly Language Program for 8 bit number stored in memory location BABAH. Separate the two nibbles and multiply it. Store the result in memory location DADAH. (July 2019)

Ans. :

LXI H, BABAH	; Load HL reg. pair with BABAH m.L.
MOV A, M	; move memory content to reg. A.
ANI 0FH	; Logically AND 0FH with accumulator
MOV B, A	; move reg. A data to reg. B
MOV A, M	; move memory content to accumulator
ANI F0H	; Logically AND F0H with accumulator
RRC	; Rotate accumulator right by 1 bit
RRC	; Rotate accumulator right by 1 bit
RRC	; Rotate accumulator right by 1 bit

RRC	; Rotate accumulator right by 1 bit
MOV C, A	; move reg. A data to reg. C
INX H	; Increment HL reg. pair by 1
MOV M, B	; move reg. B data to memory
INX H	; Increment HL reg. pair by 1
MOV M, C	; move reg. C data to memory
SUB A	; clear accumulator
ADD B	; Add reg. B data with accumulator
DCR C	; Decrement Reg. C data by 1
JNZ	; Jump if not zero jump on specify label
STA DAD A	; Store accumulator data to DAD AH m.L.
HLT	; Stop

191) Write an Assembly Language Program to find the sum of series. Length of series is stored in memory location 1500H and series begins from memory location 1501H. Store the 16 bit sum from memory location 1600 H beginning with lower order byte. (July 2019)

Ans. :

	LXI H, 1500H	; Load HL reg. pair with 1500H m.L.
	MOV C, M	; move memory content to reg. C
	SUB A	; subtract accumulator content from itself
	MOV B, A	; move reg. A data to reg. B
	INX H	; Increment HL reg. pair by 1
	ADD m	; Add memory content with accumulator
	INC label	; Jump if no carry jump on label
	INR B	; Increment reg. B content by 1
label	DCR C	; Decrement reg. C content by 1
	JNZ	; Jump if not zero jump on specify sign
	STA 1600H	; Store accumulator content at 1600H m.L.
	MOV A, B	; move reg. B data to reg. A
	STA 1601H	; Store accumulator content to 1601H m.L.
	HLT	; Stop

192) Study the given program and answer the questions given below : (July 2019)

STC

CMC

LXI B, 1234H

MOV A, B

RAR

```
MOV H, A
MOV A, C
RAR
MOV L, A
HLT
```

(i) **Write the purpose of the program.** **2**

(ii) **Write contents of various registers used.** **2**

(iii) **Write comments of various instructions used in the program.** **1**

Ans.:

(i) Rotate reg. pair content by 1 time.

(ii) Cy = 0

B = 12 After RAR on it H = 09

C = 34 After RAR on it L = 1A

A = 1A

∴ Reg. B = 12, Reg. H = 09, Reg. A = 1A

Reg. C = 34 Reg. L = 1A

(iii)

STC	; Set carry flag
CMC	; Complement carry flag
LXI B, 1234 H	; Load BC reg. pair with 1234H m.L.
MOV A, B	; move B reg. data to reg. A
RAR	; Rotate accumulator content right by 1
MOV H, A	; move accumulator dat to reg. H
MOV A, C	; move reg. C content to accumulator
RAR	; Rotate accumulator content right by 1
MOV L, A	; move accumulator data to reg. L
HLT	; Stop

193) **Flag register contain data C5H interpret its meaning.** (March 2020)

Ans.: C5 = 1100 0101

D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0
1	1	0	0	0	1	0	1
S	Z	X	AC	X	P	X	Cy

S = 1 = Set = Accumulator content is negative no.

Z = 1 = Set = Accumulator content means result is zero
AC = a = reset = In accumulator content carry is not generated from D_3 to D_4
P = 1 = Set = In accumulator content even no. of 1's present
Cy = 1 = Set = There is carry or borrow generated in accumulator content

194) The accumulator contain data 58H and register B contain data 07H. What will be the content of Accumulator after execution of following instruction independently :
(i) ADD B (ii) ORA B (iii) ANA B (March 2020)

Ans. :

ACC = 58H = 0101 1000
Reg. B = 07H = 0000 0111

(i) ADD B

A = 58 H = 0101 1000
B = 07 H = 0000 0111
Additional Operation = 0101 1111
5 F

∴ ADD B =5FH Accumulator content

(ii) ORA B

A = 58 H = 0101 1000
B = 07 H = 0000 0111
Logical OR Operation = 0101 1111
5 F

∴ ORA B = 5FH Accumulator content

(iii) ANA B

A = 58 H = 0101 1000
B = 07 H = 0000 0111
Logical AND Operation = 0000 0000
0 0

∴ ANA B = 00H Accumulator content

195) A block of data is stored from memory location D001H. Length of block is stored at D000H. Write a program to find occurrences of data 02H in given block. Store the number of occurrences at Memory Location D100H. (March 2020)

Ans. :

LX1 H, D000H	; Load HL seg. Pair with D000H
MOV B, M	; move memory content to reg. B
MVI A, 02H	; move immediate 02 to reg. A
MVI C, 00H	; move immediate 01 to reg. B
INX H	; Increment HL reg. pair by 1
CMP M	; compare memory content with OC
JNZ X	; Jump if not zero jump on specific label
INR C	; Increment, c reg. content by 1

X DCR B	; Decreased B reg. content by 1
JNZ	; Jump if net zero jump to specify label
MOV A, C	; move reg. c content acc
STA D100H	; store directly acc. Content to D001H
HLT	; stop up

196) **A block of data is stored from memory location D001H to D005H. copy the contents of block to another block starting from 2501H.** (March 2020)

Ans. :

LX1 H, D001H	; load HL reg. pair with D001H
LXI B, 2501H	; load BC reg. pair with 2501H
MVI D, 05H	; move 05 data to reg. D
X MOV A, M	; move memory content to acc.
SATX B	; store BC reg. pair content to acc.
INX H	; Increment HL reg. pair by 1
INX B	; Increment BC reg. pair by 1
DCR D	; Decrement D reg. content by 1
JNZ X	; Jump if not zero to specify label
HLT	; Stop up

197) **Write a program to subtract 3 Byte integer in register EHL from another 3 Byte integer in BCD. The result should be placed in BCD register keeping the integers in EHL undisturbed.** (March 2020)

Ans. :

STC	; set carry flag
cmc	; complement carry flag
MOV A, D	; move reg. D content to acc.
SUB L	; subtract reg. L content from acc. coil
MOV D, A	; move reg. A content to reg. D
MOV A, C	; move reg. C content to reg. A
SBB H	; subtract H reg. with borrow from acc.
MOV C, A	; move reg. A content to reg. C
MOV A, B	; move reg. B content to reg. A
SBBE	; subtract E reg. with borrow from acc.
MOV B, A	; move reg. A content to reg. B
HLT	; stop up

198) A block of data is stored in memory location from 3330H. Length of block is stored at 2FFFH. Write a program to find 2's compliment of each data in a block and store the result from memory location 4100H. (March 2020)

Ans. :

LXI D, 4100 H	; load DE reg. pair with 4100 H m.L.
LXI H, 2FFFH	; load HL reg. pair with 8FFFH m.L.
MOV C, m	; move memory content to reg. C.
INX H	; Increment HL reg. pair by 1 m.L.
MOV A, m	; move memory content to accumulator
CMA	; complement accumulator content
INR A	; Increment reg. A content by 1
STAX D	; Store acc. Content to DE reg.
INX H	; Increment HL reg. pair by 1 m.L.
INX D	; Increment DE reg. pair by 1 m.L.
DCR C	; Decrement C reg. content by 1.
JNZ	Jump if not zero jump to specify
HLT	Stop up

199) A block of data is stored from memory location C001H and length is stored in C000H. Write a program to find the sum of series and store the sum in CO50H and CO51H. (March 2020)

Ans. :

MVI A, 00H	; move 00H data to reg. A
MVI B 00H	; move 00H data to reg. B
LXI H, C000H	; Load HL reg. pair to C000H
MOV C, M	; move memory content torque
INX H	; Increment HL reg. by 1
ADD m	; Add memory content with ac content
JNC	; Jump if not carry jump to specific label
INR B	; Increment reg. B content by 1
INX H	; Increment HL reg. pair by 1 m.L.
DCR C	; Decrement reg. C content by 1
JNZ	; Jump if not zero jump on specific label
STA CO50H	; Store acc. Content at label content
MOV A, B	; move reg. B content to reg. A
STA C051H	; Store acc. Content to C051 m.L.
HLT	; Stop up

200) Write a program that divides two 1 byte hex number where the dividend is stored in 4060H and divisor in 406H stored the quotient and remainder in next two consecutive memory location respectively. **(March 2020)**

Ans. :

MVI B, 00H	; move 00H data to reg. B
LXI H, 4060H	; load HL reg. pair with 4060 m L.
MOV A, M	; move memory content to acc.
INX H	; Increment HL reg. pair by 1
CMP M	; compare memory content with acc.
JNC	; Jump if carry jump on specify
SUB M	; subtract memory content from acc. content
INR B	; Increment B reg. content by 1
JMP	; Jump unconditional to specify
INX H	; Increment HL reg. pair to
MOV M, B	; move reg. B content to
INX H	; Increment HL reg. pair by
MOV M, A	; move reg. A content to acc.
HLT	; Stop up

201) Write an Assembly Language Program to count data D9H in a block of 10 memory locations starting from C020 H Store the result at CO50 H. **(Dec. 2020)**

Ans. :

Label	Mnemonics+ Operand	Comments
START	MVI C, 0AH	; Store count 0AH in register C
	MVI B, 00H	; Initialize occurrence count in register B.
	LXI H, C020H	; Initialize H-L pair with starting address
LOOP	MOV A, M	; Get the number in accumulator
	CPI D9H	; Check whether the number in accumulator is D9H
	JNZ NEXT	; If no ? jump to label NEXT
	INR B	; Yes, increment content in register B by 1.
NEXT	INX H	; Increment H-L pair
	DCR C	; Decrement count
	JNZ LOOP	; Is count zero ? No-jump to label LOOP
	MOV A, B	; Get count in accumulator
	STA C050, H	; Store count of occurrence at C050 H
END	HLT	; Stop processing

202) Write an Assembly Language Program to exchange a block of 15 memory locations starting from D040 with another block starting from D050 H. **(Dec. 2020)**

Ans. :

Memory address	Label	Mnemonics	Comments
C000		LXI H, D040 H	; Set up HL as source memory
C003		LXI D, D050 H	; Setup DE as an index for destination
C006		MVI B, 0FH	; Setup B to 0FH
C007	NEXT	INX H	; Pointer to next source location
C008		MOV C, M	; Get databyte from source memory
C009		LDAX D	; Load databyte from destination in acc.
C00A		MOV M, A	; Store [A] in first block
C00B		MOV A, C	; Copy [C] into [A]
C00C		STAX D	; Store [A] at second block
C00D		INX D	; Pointer to next destination location
C00E		DCR B	; decrement count
C00F		JNZ NEXT	; Repeat the loop
C012		HLT	; Stop

203) Study the program and answer the questions given below : **(Dec. 2020)**

Label	Mnemonics
	LXI H, CO2FH
	MOV A, M
	MVI D, 00 H
	MVI B, 08 H
Back	RRC
	JNC GO
	INR D
Go	DCR B
	JNZ back
	INX H
	MOV M, D
	HLT

(i) Write the comments of the each instruction of the program.

(ii) Write the purpose of the program.

(iii) Input data stored at CO2F H is D7 H, Write the address of the memory location where the result is stored. Also write the resultant data.

Ans. :

Label	Mnemonics	
	LXI H, CO2FH	; Load HL reg pair at C02F m.L.
	MOV A, M	; move mem content to accumulator
	MVI D, 00 H	; move immediate 00H data to D reg.
	MVI B, 08 H	; move immediate 08H data to B reg.
Back	RRC	; Rotate accumulator content right by 1 bit
	JNC GO	; jump if no carry jump to go label
	INR D	; Increment reg by 1 content
Go	DCR B	; Decrement reg. B by 1 content
	JNZ back	; Jump if not zero jump on back label
	INX H	; Increment HL reg by 1 memory location
	MOV M, D	; move D reg content to memory
	HLT	; stop the microprocessor

(ii) Count number of 1's in the given data

(iii) Output C030H = 06H

204) **Write an Assembly Language Program to multiply two, one byte numbers stored at 3050 H and 3051 H. Store the result in the next two consecutive memory locations beginning with lower byte.** **(Dec. 2020)**

Ans. :

Label	Mnemonics Operand	Comments
	XRA A	; Initialize accumulator with 00H
	MOV B, A	; Initialize register B with 00H
	LXI H, 3050H	; Initialize H-L Pointer to address 3050H
	MOV C, M	; Get first number in register C
	INX H	; Get address of second number in H-L pair
VY	ADD M	; Add two numbers
	JNC XX	; Is carry ? No – Jump to label XX
	INR B	; Increment count in register B by 1 to store MSB
XX	DCR C	; Decrement count in register by 1
	JNZ YY	; Is zero? No – Jump to label yy
	STA 3052H	; If yes, store LSB of product at 3052H
	MOV A, B	; Get MSB in register A
	STA 3053H	; Store MSB of product at 3053H
	HLT	; Stop processing

205) Write an Assembly Language Program to find 2's complement of one byte number stored from memory locations C030 H to C039. Store the result from C040 H to C049 H respectively. **(Dec. 2020)**

Ans. :

Label	Mnemonics + Operand	Comments
START	LXI H, C030H	; Initialize H-L pair with address of first number.
	LXI B, C040H	; Initialize B-C pair with destination address.
	MVI D, 0AH	; Store count in register D
LOOP	MOV A, M	; Get the number in accumulator
	CMA	; 1's complement of number in accumulator
	INR A	; 2's complement of number in accumulator.
	STAX B	; Store 2's complement at address pointed to by BC pair.
	INX H	; Increment H-L pair
	INX B	; Increment B-C pair
	DCR D	; Decrement count in register D
	JNZ LOOP	; Is count zero ? no-jump to lable LOOP
END	HLT	; Stop the processing

206) Study the program and answer the questions given below : **(Dec. 2020)**

	Mnemonics
	LXI H, 1200 H
	MOV A, B
	MOV B, M
	RLC
	RLC
	RLC
	RLC
	ADD B
	INX H
	MOV M, A
	HLT

(i) Write the comments of the each instructions of the program.

(ii) Write the purpose of the program.

(iii) Input data stored at 1200 H is 4A H. Write the address of the memory location where the result is stored.

Also write the resultant data.

Ans. :

	Mnemonics	
	LXI H, 1200 H	; load HL reg pair at 1200H memory location
	MOV A, B	; move memory content to accumulator
	MOV B, M	; move memory content to reg B
	RLC	; Rotate accumulator content left by 1 bit
	RLC	; Rotate accumulator content left by 1 bit
	RLC	; Rotate accumulator content left by 1 bit
	RLC	; Rotate accumulator content left by 1 bit
	ADD B	; Add accumulator data with reg B content
	INX H	; Increment HL reg pair by 1
	MOV M, A	; move accumulator content to memory
	HLT	; stop the microprocessor

(ii) Exchange nibble position and add new no. with original.

(iii) Output at 1201H = EEH

207) Write an ALP to separate nibbles of a data byte stored at memory location C050H. Stores the separated nibbles in register B and C respectively. **(Oct. 2021)**

Ans. :

LXI H, C050 H	; Load HL reg. pair with C050H mem.
MOV A, M	; Move mem content to accumulator.
MOV D, M	; move mem content to reg. D.
ANI, 0FH	; AND immediately 0FH with accumulator content.
MOV C, A	; move accumulator content to reg. C.
MOV A, D	; move D reg. content to accumulator.
ANI F0H	; AND immediately F0H with accumulator content.
MOV B, A	; move accumulator content to reg. B.
HLT	; Stop the microprocessor.

208) Write an ALP to find the sum of odd numbers in a block of data stores from memory location C030H to C037H. Stores the sum at memory location C038H. **(Oct. 2021)**

Ans. :

Label	Mnemonics + Operand	Comments
START	LXI D, 0000H	; Initialize sum
	MVI C, 05H	; Initialize counter
	LXI H, C030H	; Initialize pointer
NEXT	MOV A, M	; Get the number in accumulator
	RRC	; Check LSB
	JNC SKIP	; Don't add if number is even
	MOV A, E	; Get the lower byte of sum
	ADD M	; SUM = SUM + data

Label	Mnemonics + Operand	Comments
	JNC SKIP1	; If no carry ? Go to SKIP1
	INR D	; Add carry to MSB of sum
SKIP1	MOV E, A	; Store result in E register
SKIP	INX H	; Increment pointer
	DCR C	; Decrement counter
	JNZ NEXT	; Check if counter ≠ 0 repeat
	XCHG	; Get sum in HL
	SHLD C038H	; Store sum
	HLT	; Terminate program execution

209) Write an ALP to copy a block of data from C050H to C054H to another block of data starting from C060H to C064H in reverse order. **(Oct. 2021)**

Ans. : Assembly language program :

Memory address	Label	Mnemonics	Comments
C000		LXI H, C054H	; set up HL as a pointer to source
C003		LXI D, C060H	; set up DE as a pointer to destination
C006		MVI B, 05H	; set up B to count 16 bytes
C008	Loop	MOV A, M	; get data byte from memory
C009		STAX D	; Store data byte at destination
C00A		DCX H	; Decrement source pointer
C00B		INX D	; Increment destination pointer
C00C		DCR B	; Decrement count
C00D		JNZ Loop	; if not zero, go back
		HLT	; Stop

210) Write an ALP to count the number of occurrences of data A4H in a block of memory locations starting from memory location C051H. The length of block is stored at memory location C050H. Store result at the end of block. **(Oct. 2021)**

Ans. :

Label	Mnemonics	Comments
	LXI H C050H	; initialize the first memory location
	MVI C, M	; move mem. to reg. C data
	MVI B, 00 H	; Initialize reg. B to store occurance byte counter
	INX H	; Increment mem. Location

Label	Mnemonics	Comments
BACK	MOV A, M	; Take the mem. Contents to accumulator
	CPI A4H	; Check if accumulator matches the data A4H
	JNZ SKIP	; If accumulator doesn't contain A4H, jump to skip
	INR B	; Update the value of occurance counter
SKIP	INX H	; Get the next memory location
	DCR C	; Decrement reg. C content by 1
	JNZ BACK	; If counter ≠ 0, jump to the label "BACK"
	INX H	; Get the next memory location
	MOV M B	; Place occurent count by in memory
	HLT	; Stop the processing

211) Write an ALP to shift a 16 bit data towards left by 1 bit. The 16 bit data is stored at memory location C050H and C051H. Stores result in C052H and C053H. (Oct. 2021)

Ans. :

Label	Mnemonics+ operand	Comments
START	LHLD C050H	; Load 16-bit number in HL register pair
	DAD H	; Double add
	JNC AHEAD	; Jump, if no carry AHEAD
	INR L	; if carry, increment lower byte by one
AHEAD	SHLD C052H	; Store result
	HLT	; Stop program execution

212) Write an ALP to divide two 8 bit numbers. The dividend is stored at Memory location C001H and Divisor is stored at memory location C002H. Stores the quotient at memory location C003H and remainder at memory Location C004H. (Oct. 2021)

Ans. : Assembly language program :

Memory address	Label	Mnemonics	Comments
C000		LXI HC001H	; Set H-L pointer to dividend
C003		MVI C, 00H	; Set Initial quotient = 00
C005		MOV A, M	; Set Acc. = Divident
C006		INX H	; Set H-L pointer to divisor
C007	Loop	CMP M	; Is N1 ≥ N2 ?
C008		JC Escape	; Go to Escape if N1 < N2
C00B		SUB M	; N1 = N1 - N2
C00C		INR C	; quotient = quotient + 1
C00D		JMP Loop	; jump to again compare N1 and N2
C010	Escape	INX H	; Increment HL reg pair by 1
C011		MOV M, C	; Store C reg content i.e. quotient in C003H
C012		INX H	; Increment HL reg pair by 1
C013		MOV M, A	; Store acc content i.e. remainder in C004H
C014		HLT	; Stop

213) A block of data is stored in memory location from C101H to C10AH. Write an Assembly Language Program to transfer the block in reverse order to memory location C200H and onward. **(March 2022)**

Ans. : Assembly language program :

Memory address	Label	Mnemonics	Comments
C000		LXI H, C101H	; set up HL as a pointer to source
C003		LXI D, C209H	; set up DE as a pointer to destination
C006		MVI B, 0AH	; set up B to count 16 bytes
C008	Loop	MOV A, M	; get data byte from memory
C009		STAX D	; Store data byte at destination
C00A		INX H	; Increment source pointer
C00B		DCX D	; Decrement destination pointer
C00C		DCR B	; Decrement count
C00D		JNZ Loop	; if not zero, go back
		HLT	; Stop

214) Write an Assembly Language Program to find the product of two numbers stored in memory location C005H and C006H. Store the result in C000H and C001H. **(March 2022)**

Ans. : Assembly language program :

Memory address	Label	Mnemonics	Comments
D000		LXI H , 0000H	; Set initial product = 0
D003		LDA C005 H	; Set [Acc] = N1
D006		MOV E, A	; Set [E] = N1
D007		LDA C006 H	; Set [Acc] = N2
D00A		MVI D, 00H	; Set [D] = 00H
D00C	Loop	DAD D	; product = product + N1
D00D		DCR A	; N2 = N2 - 1
D00E		JNZ Loop	; Repeat, if $N_2 \neq 0$
D011		SHLD C000 H	; Store product in C000 and C001
D014		HLT	; Stop

215) Write an Assembly Language Program to add two BCD number stored an location 2500H and 2501H. Place the BCD result in location 2502H and onward starting with LSB. **(March 2022)**

Ans. :

Memory address	Label	Mnemonics	Comments
C000		LXI H, 2500 H	; Initialize H-L pair with address of first number
C003		MVI C, 00H	; Initialize register C to store MSB.
C005		MOV A, M	; Get first number in accumulator.
C006		INX H	; Address of next number in H-L pair
C007		ADD M	; Add two numbers
C008		DAA	; Decimal adjust accumulator.
C009		JNC L1	; Jump if no carry to label L1
C00C		INR C	; If carry, increment MSB in register C.
C00D	L1	STA 2502H	; Store the LSB of SUM in location 2502H
C010		MOV A, C	; Get MSB in accumulator
C011		STA 2503H	; Store the MSB of SUM in location 2503H
C014		HLT	; Stop the processing

216) **Write a subroutine to fill the memory location 2501H to 25FF H with Hex number 01H to FFH.** (March 2022)

Ans. :

Memory address	Label	Mnemonics	Comments
F000	FILL/START	LXI D, 2501 H	; Set memory start address
F003		XRA A	; Clear acc. and carry
F004		MVI B FFH	; load counter
		INR A	; Increment data
	LOOP	STAX D	; Store data in memory
F007		INR A	; increment data
F008		INR E	; increment memory address
F009		DCR B	; count = count - 1
F00A		JNZ LOOP	; go back if not over
		RET	; return to main program if over

217) **A Hex number is stored at location 2100H. Write an Assembly Language Program to interchange its digit, the new number is to be stored in 2105H. Add original number with new number and store the result at location 2105H.** (March 2022)

Ans. : Assembly language program :

Memory address	Label	Mnemonics	Comments
C000		LXI , 2100H	; Set H-L pointer to 2100H
C003		MOV A, M	; take no. in accumulator
C004		RRC	; with 4 RRC instructions
C005		RRC	; Interchange the digits of the no
C006		RRC	
C007		RRC	
C008		INX H	Increment HL reg pair by 1
C009		MOV M, A	; store the exchanged no. in 2101 H
C00A		DCX H	; Decrement HL reg pair by 1
C00B		ADD M	; Add new no. & original no.
C00C		STA 2105H	; Store result in 2105H
C00F		HLT	; Stop

218) Write an ALP to count the number of odd data byte occurring in a block, starting from memory location 2501H to 25FFH. Store the result at the memory location 2600H. **(March 2022)**

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI H, 2501H	; Initialize H-L pair with starting address
	MVI C, FFH	; Store count FFH in register C.
	MVI B, 00H	; Initialize odd count to zero in register B
LOOP	MOV A, M	; Get the number in accumulator
	RRC	; Rotate to determine odd or not ?
	JNC GO	; Is carry ? No-jump to label GO.
	INR B	; Yes - Increment odd count
GO	INX H	; Increment H-L pair
	DCR C	; Decrement count
	JNZ LOOP	; Is count zero ? No - jump to lable LOOP
	MOV A, B	; Get odd count in accumulator
	STA 2600 H	; Store odd count at 2600 H
END	HLT	; Stop processing.

❑❑❑

Chapter 3 Introduction to INTEL X-86 Family

Probable marks : 4

Scope of the syllabus :-

- Introduction to advanced microprocessors
- Introduction to X-86 family and study of major attributes of the X-86 family processors.
- Programming model of X-86 family of microprocessors.

Q. 1 Draw a block diagram of 8086 and explain it.

Ans. :

1) As shown in the block diagram, the 8086 C.P.U. is divided into two independent functional parts :
   1. Bus Interface Unit (B.I.U.)
   2. Execution Unit (E.U.)
2) The B.I.U. functional part contains queue, segment registers and instruction pointer.
3) Execution unit (E.U.) contains flag register, general purpose registers, stack pointer register and other pointers, index registers.

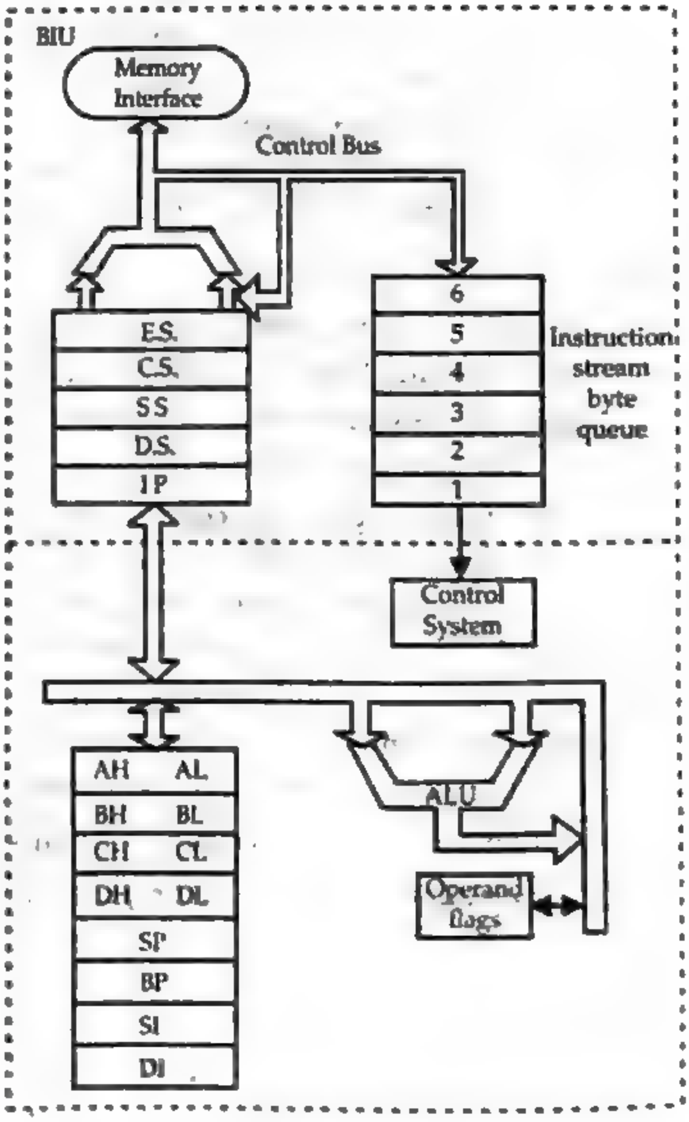


Fig. 3.1

Q. 2 Explain in brief 8086 architecture.

Ans. : The 8086 C.P.U. is divided into two independent functional parts :

I) Bus Interface Unit (B.I.U.)

II) Execution Unit (E.U.)

I. Bus Interface Unit (B.I.U.) :

The B.I.U. sends address, fetches instruction from memory, reads data from ports/memory and writes data to ports/memory. In other word, B.I.U. handles transfer of data and address on buses for execution unit. It consists of following parts :

(a) Queue : To speed up execution of program, B.I.U. fetches 6 instruction bytes ahead of time from memory and stores them for E.U. in the FIFO register, called queue.

(b) Segment registers : B.I.U. contains following 16-bit segment registers :

i) Extra segment (E.S.)

ii) Code segment (C.S.)

iii) Stack segment (S.S.)

iv) Data segment (D.S.)

These 16-bit segment registers are used to store 16-bit starting address of memory segment.

(c) Instruction pointer (I.P.) : The code segment (C.S.) register holds 16-bit starting address of segment, from which B.I.U. is fetching instruction code bytes. The IP register holds 16-bit address of next code byte within code segment.

II. Execution Unit (E.U.) :

Execution unit of 8086 tells B.I.U. where to fetch instructions or data, decodes instruction and executes them. The following sections describe functional part of E.U. :

(a) Flag register : Flag is a flip-flop, which indicate some condition. The 8086 has 16-bit flag register with 9-active flags.

(b) General purpose registers : 8086 has 8 general purpose registers, labelled AH, AL, BH, BL, CH, CL, DH and DL. These registers can be used individually for temporary storage of 8-bit data. The AL register is also called as accumulator. These registers in certain pairs can be used as 16-bit registers. These pairs are AH and AL (AX), BH and BL (BX), CH and CL (CX), DH and DL (DX).

(c) Stack pointer : The 8086 allows us to set 64KB of memory as stack. The 16-bit starting address of stack is stored in stack pointer.

Q. 3 Explain any two microprocessors in X-86 family in brief.

OR Explain the following microprocessors in Intel's X-86 family. **(Oct. 04; March 05**

Ans. :

I) 8086 :

1) 8086 is a **16-bit** microprocessor, introduced by INTEL in 1978.

2) It was designed to be used as C.P.U. in microcomputer system. It's A.L.U., internal registers can work with 16 binary bits at a time.

3) 8086 has 16-bit data bus and 20-bit address bus, so that it can address a physical memory of 2^{20} = 1048576 = 1 M Byte memory locations.

4) The least significant 8 bits of address bus are passed on same eight lines as that of data bus. This bus is known as multiplexed bus.

5) In 8086, words are stored in two consecutive bytes. If first byte of word has even address, then 8086 can read it in single operation. Else, it requires two operations.

6) This processor supports multiplication and division operations.

7) The 80186 is an improved version of 8086. In addition to 16-bit C.P.U., it has programmable peripheral (I/O) devices integrated in same package. Instruction set of 80186 is superset of instruction set of 8086.

II) 80286 :

1) 80286 is a **16-bit** microprocessor, introduced in 1982. This advanced version of 8086 is specially designed to be used as a C.P.U. in multiuser/multitasking operating systems.

2) 80286 has 16-bit data bus and 24-bit address bus.

3) In 1984, IBM introduced PC/AT (Personal Computer/Advanced Technology) version of its PC using 80286.

4) 286 was having real and protected modes of operation. In real mode, the processor can address only 1 Mbyte of memory, whereas in protected mode it can address 16 Mbytes of memory.

5) Another new feature was the ability to work upto 1 Gbyte of virtual memory and yet another feature was added hardware multitasking.

6) The program written for 8086 can run on 80286, operating in its real address mode.

III) 80386 : **(July 2018)**

1) The INTEL's 80386 is a 32-bit microprocessor introduced in 1985.

2) 80386 is a logical extension of 80286. It is more highly pipelined.

3) The instruction set of 80386 is a superset of other members of 8086 family.

4) It has 32-bit data bus and 32-bit nonmultiplexed address bus. It can address a physical memory of 2^{32} i.e. 4 Gbytes. The 80386 memory management allows it to address 2^{46} or 64 Tbytes.

5) The 386 can be operated in one of the following memory management modes :

   i) Paged mode

   ii) Non-paged mode.

6) When operated in paged mode, the 386 switches the paging unit then after the segment unit. The paging unit allows memory pages of 4 kB each to be swapped in and out from disk. In non-paged mode, memory management unit operates very similar to the 286.

7) Virtual addresses are represented with selected components and an offset component as they are with 80286.

IV) 80486 : (July 2018

1) Intel's 80486 is a 32-bit microprocessor. It was introduced in 1989.
2) It has 32-bit address bus and 32-bit data bus.
3) The 486 is basically a large integral circuit which contains a fast built-in, a math coprocessor, a memory management unit (M.M.U.), and an 8 kbyte cache memory.
4) 80486 has DX and SX versions.
5) All 486 processors have 32-bit data bus. SX version does not have on chip-numeric coprocessor.
6) The 486 achieves its high speed operation from its faster clock speeds, internal pipe lined architecture and the use of reduced instruction set computing (RISC) to speed up the internal microcode.
7) 486 also has 486 DX2 and 486 DX4 versions, with double and triple clock speed.

V) Pentium or 80586 : OR

Explain the main features of a pentium processor. (Mar.03, 2011, Oct.04

1) Pentium is a 64 bit microprocessor, introduced in 1993.
2) It has 64 bit data bus and 32-bit address bus. The use of super scalar architecture incorporates a dual-pipe lined processor, which lets the pentium process more than one instruction per clock cycle.
3) The addition both of data and code caches on chip is also a feature designed to improve processing speed.
4) A new advanced computing technique used in pentium is called the branch prediction, the pentium makes an educated guess where the next instruction following a conditional instruction will be. This prevents instruction cache from running dry during conditional instructions.
5) The pentium has 64-bit data bus. This means that it can perform data transfers with an external device twice as fast as a processor with a 32 bit data bus.

Q. 4 Compare 80486 and 80586. (Oct. 2011; March 201

Ans. :

Sr. No.	80486	80586 (Pentium I)
1.	It is 32 bit Microprocessor.	It is 64 bit microprocessor.
2.	It's operating speed — 25 to 50 MHz	It has 50 — 100 MHz operating speed.
3.	It has 32 bytes cache memory.	It has 8 kbytes cache memory.
4.	It has external math co-processor.	It has Internal math co-processor.
5.	It was evolved in 1989-SX and 1991-DX version.	It was evolved in 1993.

Q. 5 Compare any four attributes of 486 DX with Pentium Processor. **(March 12, 19)**

Ans.:

Attributes	80486 DX	Pentium
Data bus	It is 32 bit microprocessor.	It is 64 bit microprocessor.
Operating speed (MHz)	Clock frequency 25-50 MHz	Clock frequency 50 - 100 mHz
Introduction date	It was evolved in 1991.	It was evolved in 1993.
Instruction Cache	It has 32 bytes memory.	It has 8 Kbytes memory.

Q. 6 Compare any four attributes of 80386 & Pentium processor. **(Oct. 12; March 19)**

Ans. :

	Attribute	80386	Pentium
(1)	Data bus	It is 32 bit microprocessor	It is 64 bit microprocessor
(2)	Instruction cache	It has 16 byte cache memory	It has 8 Kbyte cache
(3)	Data cache	It's data cache is 256 bytes	It's data cache is 8 Kbyte
(4)	Math co-processor	It has external co-processor	It has internal co-processor
(5)	Internal data word size	Word size is 16 bit	Word size is 32 bits
(6)	Introduction data	It was introduced in 1985	Introduced in 1993
(7)	Operating speed in MHz	16-50 MHz	50-100 MHz

Q. 7 List the advanced microprocessors of INTEL X-86 family and mention three attributes of any one of them. **(Oct. 03)**

Ans. : List of INTEL X-86 microprocessors family :

- 8086
- 80286
- 80386
- 80486
- INTEL PENTIUM
- PENTIUM II
- PENTIUM III
- PENTIUM IV

For writing attributes of anyone of above please refer Q. No. 3.

Q. 8 Explain the advantages of the pentium processor with respect to the following features :

1) Dual pipelining 2) On-chip caches

3) Branch prediction 4) 64-bit data bus **(Mar. 06, 10, 20; Oct. 08, 10, July 19)**

Ans. :

1) Dual pipelining :

The use of super scalar architecture incorporates a dual-pipelining in pentium processor, which lets pentium to process more than one instruction per clock cycle and achieve a high level of performance.

2) On-chip caches :

The data and code on-chip caches improves the processing speed of the pentium processor.

3) Branch prediction : **(Mar 2010)**

i) The advantage of branch prediction is that, using it, the pentium makes an educated guess where the next instruction following a conditional instruction will be.

ii) This prevents the instruction cache from running dry during conditional instruction.

4) 64-bit data bus :

i) Pentium has 64 bit data bus which allows higher speed of data transfer to it.

ii) The data transfer speed of pentium is twice as fast as a processor with 32-bit data bus.

Q. 9 Compare any four attributes of 80286 and Pentium microprocessor. OR State four differentiating features among any two X86 family microprocessors. **(March 2004, 2010, Oct. 2006)**

Ans. :

Attributes	80286	Pentium
Database	It is a 16-bit microprocessor.	It is a 64-bit microprocessor.
Address bus	Address bus is 24-bit hence can access 16 MB memory.	Address bus is 32-bit hence can access 4 GB memory.
Operating speed (MHz)	Clock frequencies 6 MHz to 20 MHz.	Clock frequencies 50 MHz to 100 MHz.
Memory management	External	Internal
Math co-processor	External	Internal

O. 10 Compare any four attributes of 80286 and 80486 Processors. **(March 2013; July 18)**

ns. :

Attributes	80286	80486
Data bus	16 bits	32 bits
Address bus	24 bits	32 bit
Operating speed	6-20MHz	25-50 MHz
Physical memory address	16 M bytes	4 G bytes
Internal data word size	16 bits	32 bits
Introduction data	1982	1989

Programming Model of X-86 Family

Q. 11 State any six advance features of X -86 Micropreocessor Family. **(Oct. 2009)**

Ans : Advance features of X-86 Microprocessor family are as follows :

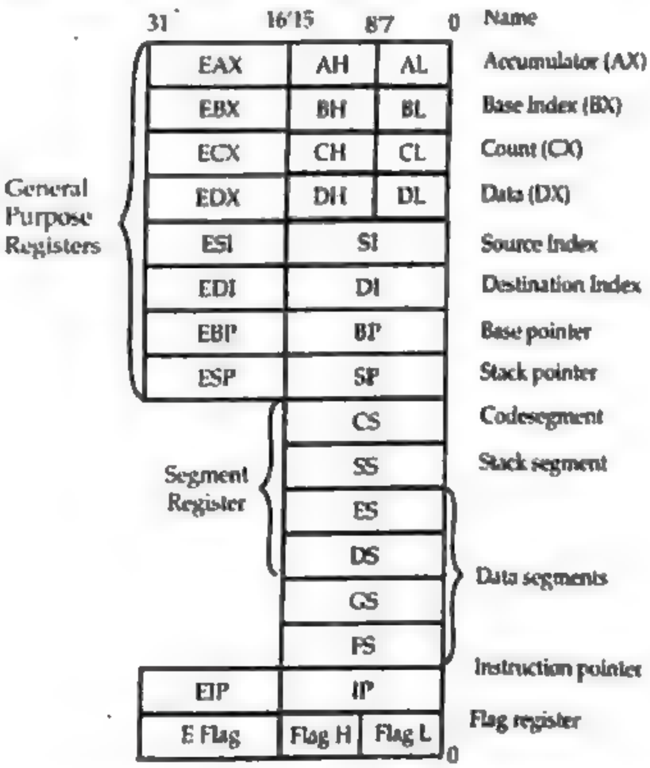
1) It is capable of performing various computing functions and making decisions to change the sequence of program execution.

2) It is very powerful computing device.

3) Coprocessor – Advanced microprocessors are supported by numeric coprocessor. It is separate CPU which perform arithmetic functions & trigonometric functions.
4) Operating System : Microprocessor works with multiuser & multitasking operating system.
5) Virtual Memory : Advanced microprocessor supports virtual memory technique for storing large volume of data.
6) Microprocessor includes special instructions & internal h/w which allow a programmar or to write s/w without knowing how much memory is available.

Q.12 Explain the programming model for 32-bit version of X-86 family with suitable diagram. (March 02, 08, 22, Oct. 05, 07)

Ans. : 1) The 8088 and 8086 defines the base programming model for the entire X-86 family of advanced microprocessors.
2) The newer members of X-86 family have greater computing power because they are faster, they use 32-bit registers instead of 16-bit registers and they have advanced addressing techniques.
3) Following figure shows programming model for 32-bit version of X-86 family used in 32 bit microprocessor family i.e. in 386, 486 and pentium.:



4) The programming model of 32-bit version of X-86 family consists of 3 register groups.
5) The first group contains eight general purpose registers called EAX, EBX, ECX, EDX, ESI, EDI, ESP and EBP registers. Where E tells us that these registers have extented length. Each register can be addressed in 1, 8, 16 or 32-bit models. These registers are used to store data during computations.
6) The second group of registers is the segment group. This group consists of code segment, stack segment and four data segment registers. The data segment registers are DS, ES, FS and GS. These are 16-bit registers. These registers manage operation with external memory. Address computations and data movements are performed here.
7) The third set of registers consists of Instruction Pointer (I.P.) and flag register.

Q. 13 Draw neat labelled diagram and explain the programming model of 16-bit version of X-86 family with register set. **(Oct. 2002, March 2005, 10, July 2017, 18)**

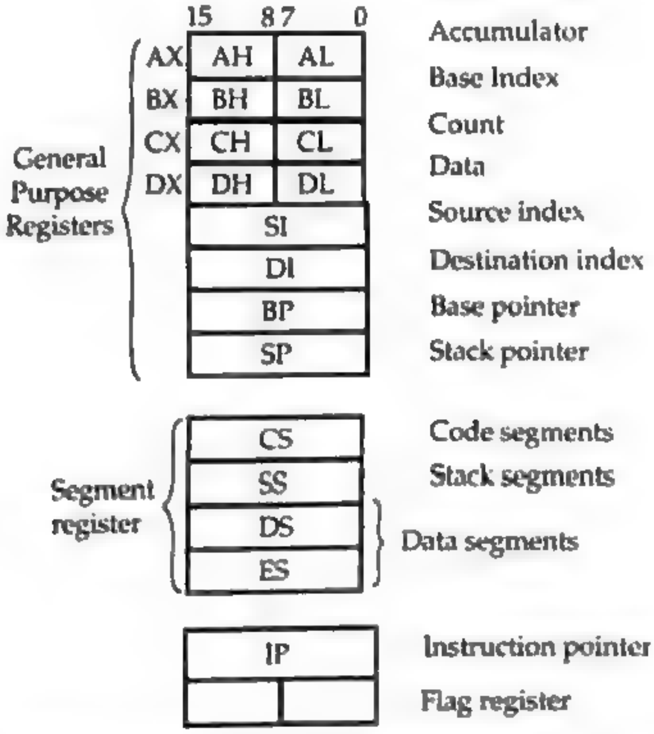
OR Draw neat labeled diagram of the programming model of 16 bit version of X-86 family. **(Dec. 2020)**

OR Explain the programming model of 16 bit version of X86 family with suitable diagram? **(Oct. 2021)**

Ans. : 1) The 8088 and 8086 defines basic programming model for X-86 family.

2) The 16-bit version for programming model is used in 16-bit microprocessors of X-86 family i.e. in 8088, 8086 and 80286.

3) The 16-bit version of programming model of X-86 family is shown in the following figure.



Programming model of 16-bit version of X-86 family

4) As shown in above figure the programming model of 16-bit version of X-86 family consists of three register groups.

5) The first group contains 8-general purpose registers called A, B, C, D, SI, DI, SP and BP registers. AL, BL, ... indicates lower bytes and AH, BH, ... indicates higher bytes. The full 16-bit registers are referred as AX, BX, CX and DX, where X stands for extended SI, DI, BP, SP registers are always treated as 16-bit registers. These are pointer registers because they are used to point locations within a segment.

6) The second group of registers is the segment group of registers. This group consists of code segment, stack segment and two data segment registers. Operation with external memory. Address computations and data movements are performed here.

7) The third group of registers consists of instruction pointer (IP) and flag register.

Q. 14 Enlist the different flags provided by 8086 microprocessor.

Ans. : The microprocessor 8086 has 16-bit flag register with 9 active flags, which are shown in following figure.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
U	U	U	U	OF	DF	IF	TF	S	Z	U	AC	U	P	U	Cy	**(U empty)**

where,

Cy - Carry flag, P - Parity flag,
AC - Auxiliary carry flag, Z - Zero flag,
S - Sign flag, TF - Single step trap,
IF - Interrupt flag, DF - direction flag
OF - over flow flag

Q. 15 Draw a neat labelled diagram of flag register of X86 family. (March 2003, Oct. 2005)

Ans. : Flag register is used to store special results from data operations. The flag register of X86 family is shown in following figure.

31	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reversed	A_C	V_M	R_F	O	N_T	IO	PL	O	D	I	T	S	Z	–	A	–	P	–	C

where -

$C \rightarrow$ Carry flag (CF)
$A \rightarrow$ Auxilliary carry flag (AF)
$S \rightarrow$ Sign flag (SF)
$I \rightarrow$ Interrupt flag (IF)
$O \rightarrow$ Overflow flag (OF)
$N_T \rightarrow$ Nested task flag
$V_M \rightarrow$ Virtual mode flag
$P \rightarrow$ Parity flag (PF)
$Z \rightarrow$ Zero flag (ZF)
$T \rightarrow$ Trap flag (TF)
$D \rightarrow$ String Direction flag (DF)
IOPL $\rightarrow$ I/O Privileage level
$R_F \rightarrow$ Resume flag
$A_C \rightarrow$ Alingment Check flag

a) 8085 microprocessor has 8-bit flag register (0 - 7) with 5 flags are active.
b) 8086/8088 microprocessor has 16-bit flag register, 8 to 11 bits are introduced and remaining bits are under fined.
c) 80286 has also 16-bit flag register but 12 to 14 bits are added.
d) 80386 microprocessor has 32 bit flag register with 16 and 17^{th} bits were introduced.
e) 80486 has 32 bit flag register with new 18^{th} bit.

Remaining all positions in flag register are reserved.

Q. 16 Select the correct alternative and rewrite the following :

1. Which of the following microprocessors does not use multiplexed data/address bus ....
   (i) 8085 (ii) 8086 (iii) 80386 (iv) 80186

Ans. : (iii) 80386

2. Pentium processor has .... bit data bus and .... bit address bus.
   (i) 64, 32 (ii) 32, 64 (iii) 32, 32 (iv) 16, 32

Ans. : (i) 64, 32

3. The 8086 allows us to set .... of memory as stack.
   (i) 4 GB (ii) 64 kB (iii) 1 Mb (iv) 16 MB

Ans. : (ii) 64 kB

4. The maximum physical memory can be addressed by 286 is ....
   (i) 640 kB (ii) 1 MB (iii) 16 MB (iv) None of these

Ans. : (iii) 16 MB

5. 80386 is a .... (March 2003)
   (i) 8 bit microprocessor (ii) 16 bit microprocessor
   (iii) 32 bit microprocessor (iv) 4 bit microprocessor

Ans. : (iii) 32 bit microprocessor

6. The Intel 80286 is a .... microprocessor. **(Oct. 2005)**
(i) 16 bit (ii) 8 bit (iii) 32 bit (iv) None of these

Ans. : (i) 16 bit

7. The main difference between the older and newer versions of the aX86 and advanced microprocessor is that the general purpose register in the newer processor are
(a) 4-bit (b) 8-bit (c) 16-bit (d) 32-bit (e) 64-bit

Ans. : (d) 32 bit

8. You will find data segment registers called the FS and the GS registers on the _______ microprocessors.
(a) 8088 (b) 8086 (c) 286
(d) 386 (e) all of the above

Ans. : (d) 386

9. The length of the 8088 instruction pointer is.
(a) 4-bit (b) 8bit (c) 16 bit (d) 32 bit

Ans. : (c) 16 bit

10. A separate ALU is used with the ________ registers to perform memory location calculations.
(a) Segment (b) Flag
(c) 16-Instruction pointer (d) General purpose (e) All of the above

ns. : (a) Segment

1. A perfect queue or code cache first appeared on the.
(a) 8088 (b) 8086 (c) 286 (d) 386SX
(e) 386DX (f) 486SX (g) 486DX (h) All of the above

Ans. : (a) 8088

12. Some of the newer version of the X86 processor have an on-board memory which is used to store data as well as prefetched instructions. This is called
(a) An on-chip floating pointer (b) Virtual memory capability
(c) Cache memory (d) Any of the above

Ans. : (c) Cache memory

13. Logic which analyzes the instruction held in the code cache to anticipate what code will be needed after a branch was introduced with the.
(a) 8088 (b) 8086 (c) 286 (d) 386SX
(e) 386DX (f) 486SX (g) 486DX (h) Pentium

Ans. : (h) Pentium

14. Internally, the X86 family of advanced microprocessors has a(n) _______ architecture.
(a) 4-bit (b) 8-bit (c) 16-bit
(d) 32-bit (e) 64-bit (f) 4-bit or 8-bit
(g) 8-bit or 16-bit (h) 16-bit or 32-bit

Ans. : (h) 16 bit or 32 bit

15. The first microprocessor in the X86 family to support an on-chip instruction cache is
(a) 8088 (b) 8086 (c) 286 (d) 386SX
(e) 386DX (f) 486SX (g) 486DX (h) Pentium

Ans. : (a) 8088

16. The maximum physical memory space which can be addressed by the 286 is
(a) 640 kbytes (b) 1 Mbytes (c) 16 Mbytes (d) 4 Gbytes (e) All of the above

Ans. : (c) 16 Mbytes

17. An internal memory management unit (MMU) first appeared on the
(a) 8088 (b) 8086 (c) 286 (d) 386SX
(e) 386DX (f) 486SX (g) 486DX (h) Pentium

Ans. : (c) 286

18. On-chip floating pointer arithmetic units first appeared on the
(a) 8088 (b) 8086 (c) 286 (d) 386
(e) 486 (f) Pentium

Ans. : (e) 486

19. If the processor you are using does not have enough physical memory for the program that is being used, you can use ________ to make the program believe that the processor has enough main memory for the program.
(a) An on chip floating point processor (b) Virtual memory capability
(c) Cache memory (d) Any of the above

Ans. : (b) Virtual memory capability

20. The first X86 advanced microprocessor to use full 32-bit data words was the
(a) 8088 (b) 386 (c) 8086 (d) 486
(e) 286 (f) Pentium

Ans. : (d) 486

21. The Intel 80286 is a _____ microprocessor. **(Oct. 2005)**
(i) 16 bit (ii) 8 bit (iii) 32 bit (iv) None of these

Ans. : (i) 16 bit

22. __________ is a 32 bit microprocessor. **(Oct. 2007)**
i) 8086 ii) 80386 iii) Intel Pentium iv) M68000

Ans : (ii) 80386

23. The Processor 80386 falls in _______ generation of MPU. **(Oct. 2009)**
(i) First (ii) Second (iii) Third (iv) Fourth

Ans. : (iv) M68000

24. Data bus of 80286 MPU is of size _________. **(March 2015)**
(i) 8 bit (ii) 16 bit (iii) 32 bit (iv) 64 bit

Ans. : (ii) 16 bit

25. The maximum physical memory can be addressed by 80286 microprocessor is __________. **(March 2017)**
(i) 640 KB (ii) 1 MB (iii) 16 MB (iv) 4 KB

Ans. : (iii) 16 MB

26. The duty 32-byte Microprocessor from the following is ______. **(July 2017)**
(i) 8086 (ii) 8085 (iii) 80386 (iv) 80586

Ans. : (iii) 80386

27 Intel 80586 was introduced in ________. **(July 2018)**
(i) 1978 (ii) 1993 (iii) 1996 (iv) 1984

Ans. : (ii) 1993

□□□

Chapter 4

Introduction to Microcontroller

Probable marks : 11

Scope of the syllabus :-

- Introduction to microcontroller
- Study of 8051 architecture and programming model.
- Overview of other microcontrollers in 8051 family.
- Applications of microcontrollers

Q. 1 What is microcontroller ? Explain in short. (Oct. 2004,2010, June 2016, March 2018)

OR

Write a note on complete microprocessor system.

Ans. :

1) A microcontroller is a complete microprocessor system, consisting of microprocessor, limited amount of ROM or EPROM, RAM and I/O ports, built on a single integrated circuit.
2) Microcontroller is infact a microcomputer, but it is called so because it is used to perform control functions.
3) The designer of a microcontroller identify all the needs to build a simple microprocessor system and puts as many as possible in a single IC.
4) For example a microcontroller must include full or nearly full implementation of a standard microprocessor, ROM or EPROM, RAM, parallel I/O ports, timer, a clock, serial ports.
5) A microcontroller is more complex than a microprocessor because it consists of many I/O components.
6) e.g. Intel's 8048, 8051.

Q. 2 Define microcontroller. State any four advantages of the same over microprocessor based system. (Mar. 02, 05, Oct. 05, 10, 19; July 19)

Ans. :

1) A microcontroller is a complete microprocessor system, consisting of microprocessor, limited amount of ROM, RAM and parallel I/O ports, built on a single integrated circuit.

2) Advantages of microcontroller over microprocessor-based system :

   (i) The cost of microcontroller is less than a microprocessor-based system.

   (ii) A microcontroller has more I/O components than a microprocessor-based system.

   (iii) Microcontrollers can be used in wide variety of intelligent products such as in personal computers key-boards. Microprocessor-based systems cannot be used in such intelligent products.

   (iv) Many low cost products such as electronic toys, electric drills, microwave ovens, VCRs are based on microcontrollers. This is not the case with microprocessor base system.

Q. 3 What are the main features of 8051 ?

OR Give any eight features of 8051.

(March 03, 04, 09,11, 18, 19, 20, Oct. 03, 04, 05, 06, 07 08, 09, Dec. 2020)

Ans. : The main features of 8051 are as listed below :

(i) The 8051 microcontroller has an 8-bit ALU.

(ii) The 8051 has 4K byte (4K × 8 bit) ROM or EPROM.

(iii) The 8051 has 128 byte (128 × 8 bit) RAM.

(iv) It has dual 16-bit timer event counter.

(v) It has 32 I/O lines for four 8-bit I/O ports.

(vi) It can address 64 kB of program memory.

(vii) It can address 64 kB of data memory.

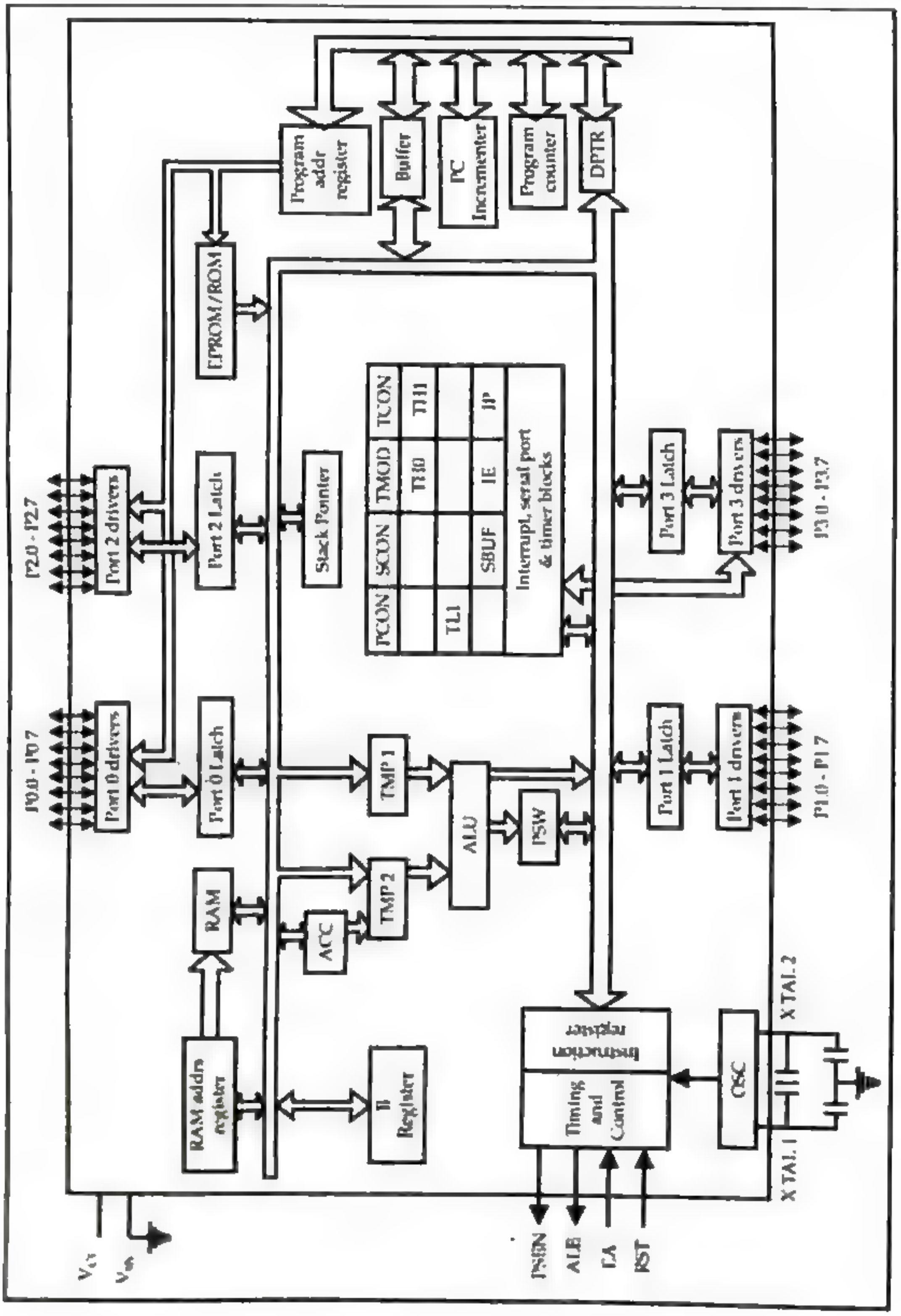
(viii) It has powerful instruction set, consisting of 111 instructions.

(ix) It has two external interrupts.

(x) The 8051 has clock upto 12-MHz frequency.

(xi) Full-featured serial port.

Q. 4 Draw an architectural block diagram of 8051 and explain it. **(Oct -2010)**



Ans. :

1) As shown in the internal block diagram of 8051, there are 32 pins for four 8-bit bidirectional ports.

2) In addition to these 32 pins, 8 pins are provided to connect clock crystal, timing and control signals and power supply.

3) The standard functions which make up microcontroller is in the centre of the diagram. This includes ALU, accumulator, stack pointer, a block of registers and general purpose register (B-register).

4) All these blocks are connected to 8051 internal 8-bit data bus through the series of registers.

5) These registers hold data during I/O transfer and control the I/O ports.

6) The architecture diagram also includes RAM and ROM. The 8051 has internal 4 kB ROM/EPROM and 128 bytes RAM.

Q. 5 Explain 8051 memory mapping for 8051 microcontroller with the help of neat diagram. **(Oct. 02, 07, March 06, 09 08, 19, 20; June 16, July 17, 19)**

OR Explain in detail how 8051 microcontrol addresses two separate memory spaces. **(March 2005,11, Oct. 2003, 21, Dec. 2020)**

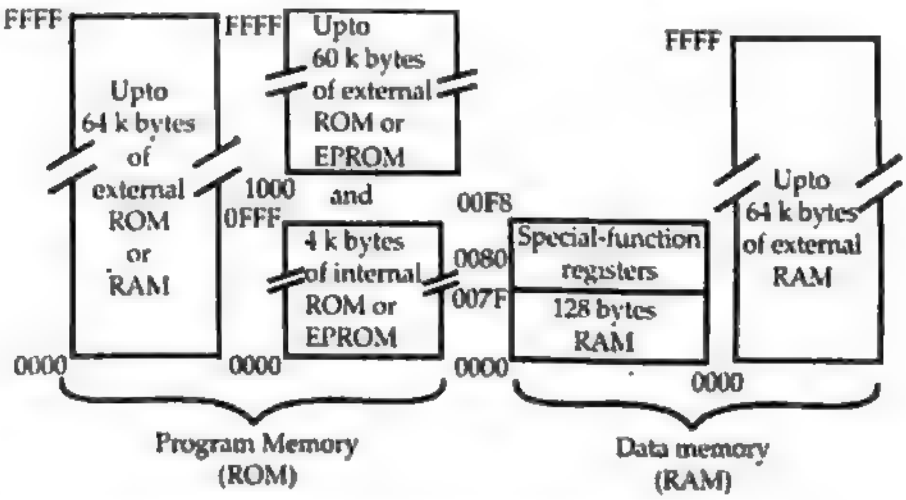
Ans. :

1) The 8051 addresses has two separate memory spaces :

   i) Program memory space

   ii) Data memory space.

2) The memory map for 8051 is shown in the following figure.



3) The program memory space is Read-only memory (ROM) space.

4) This memory space is used for storing programs and variable data.

5) It is possible to read program instructions from this space, but the processor cannot write data into this memory.

6) All instruction fetches are taken from program memory space.

7) The data memory space is a read/write memory space.

8) The processor can read data from this memory space and can write data to this memory space.

9) It cannot execute instructions from this memory space. The 8051 internal RAM is in this memory space.

10) The 128 bytes of internal RAM provide general read/write data storage. Some part of this is often referred to as registers.

11) The 8051 has 22 special function registers which are not part of 128 bytes of RAM. They occupy memory space from 80H to F8H. These registers are used for their intended purpose.

12) The 4k byte program memory can be expanded by an additional 60k bytes, making it 64k bytes program memory. The data memory can also be expanded to 64k bytes.

13) The 8051 can also be operated with common memory. In this case, 8051 only has 64k bytes of total external memory. In this configuration, 8051 can input block of data through its serial communications port load that data in memory and then execute that data as a program. This is called downloaded program. It is a very common technique used to change the program operating in a remote microprocessor - based controller.

Q. 6 Give the main features of 8048 microcontroller.

Ans. : The main features of 8048 are as listed below :

(i) 8048 has clock having frequency 2 MHz to 4 MHz.

(ii) It has 27 I/O lines.

(iii) It has 1 K byte ROM or EPROM.

(iv) It has 64 bytes RAM.

(v) It has one 8-bit timer event counter.

(vi) Address capacity of 8048 is 4 KB.

Q. 7 Explain in detail other microcontrollers in 8051 family. OR

List all microcontrollers of 8051 family and state one feature of each.

(Mar.2010,2011, Oct. 02, Oct.04; March 18)

Ans. : 8051 is a second generation microcontroller.

I) **8048, 8049, 8050 :**

1) Intel's first microcontroller was 8048. The 8048, 8049 and 8050 all have identical architectures with the exception of memory size.

2) In each case, the memory doubles. 8048 supports 1K byte of internal memory. 8049 supports 2k bytes of internal memory and 8050 supports 4K bytes of internal memory.

3) 8048 has 64 bytes internal RAM, including 32 bytes of register/memory location. The 8049 and 8050 have a total of 128 and 256 bytes of RAM respectively.

4) These microcontrollers are low cost products and hence are very popular.

II) **8052 :**

1) 8052 is a simple expansion of 8051.

2) 8052 has 8K bytes of onboard ROM and 256 bytes of onboard RAM.

3) 8052 allows programmers to write larger programs and that can use more data.

4) The cost of 8052 is more than that of 8051.

5) The 8052 also has one extra 16-bit counter-timer. This counter-timer gives more flexibility.

III) 8031 and 8032 :

1) The alternative versions of 8051 and 8052 are 8031 and 8032.
2) These devices do not have any on board ROM. It may use external ROM for program memory.
3) These are excellent devices for prototyping and low-volume products.

IV) 8052 AH-BASIC :

1) Another form of 8052 is 8052 AH-BASIC. This special 8052 has BASIC programming language in ROM.
2) Using BASIC instructions, a programmer can write instructions for this 8052 rather than assembly language.

Q. 8 Compare between microcontrollers 8051 and 8052. **(Oct. 2006,09, 21, March 2011)**

OR Compare 3 features of 8051 and 8052 microcontrollers. **(Dec. 2020)**

Ans. :

1) Microcontroller 8051 has 4k bytes of ROM, whereas 8052 has 8k bytes of onboard ROM or EPROM.
2) Microcontroller 8051 has 128 bytes of RAM, whereas 8052 has 256 bytes of onboard RAM.
3) Microcontroller 8051 has a dual 16-bit timer event counter whereas 8052 has an extra 16-bit timer event counter.
4) The cost of microcontroller 8051 is less than that of microcontroller 8052.
5) Both 8051 and 8052 are used in high volume applications and both allow us to write large program. But in 8052 we can write larger programs than that in 8051.

Q. 9 What is a Microcontroller ? State three expanded features of 8052 over 8051 microcontroller. **(March 04, 06; July 19)**

Ans. :

(1) Microcontroller : A microcontroller is a complete microprocessor system, consisting of microprocessor, limited amount of ROM, RAM and parallel I/O ports, built on a single integrated circuit.

(2) Microcontroller is infact a microcomputer, but it is called so because it is used to perform control functions.

(3) Expanded features of 8052 over 8051 microcontroller are as follows :

(a)	**ROM :**	Microcontroller 8052 has 8 Kbytes of onboard ROM or EPROM whereas 8051 has 4 Kbytes of ROM.
(b)	**RAM :**	Microcontroller 8052 has 256 bytes of onboard RAM whereas 8051 has 128 bytes of RAM.
(c)	**Time-event counter :**	8052 has an extra 16-bit time event counter whereas 8051 has a dual 16-bit timer event counter.

Q. 10 Give the applications of microcontroller. OR
Explain the various applications of microcontroller.
(March 02, 10 Oct. 08, 09; June 16; July 2017)

Ans. :

1) Microcontroller is a single chip microcomputer.
2) They are used as independent controllers in machines or as slaves in distributed processing.
3) They are used as machine tools, chemical processors, medical instrumentation and sophisticated guidance control.

4) Some applications require simple timing and bit set/reset functions; other require high speed data processing capability.

5) Many low cost products such as electronic toys, microwave ovens, VCRs are based on microcontrollers.

6) A home security system, a tape deck and intelligent multimeter can also be build by using microcontroller.

7) The personal computer keyboards are implemented with a microcontroller. It replaces scanning, debounce, matrix decoding and serial transmission circuits.

Q. 11 Differentiate between Micro-controller and a Micro-processor. (March 2016)

OR Compare Microcontroller with Microprocessor. (March 2022)

Ans. :

Micro-controller	Micro-processor
1. Micro-controller is a chip which is called single chip computer	1. A Microprocessor is a general purpose device which is called a CPU
2. Microcontroller included RAM, I/O Port, ROM, Timer in a single chip	2. Microprocessor do not contain on chip I/O ports, Timer, Memories etc.
3. Microcontroller based system design is simple and cost effective	3. Microprocessor based system designer is complex and expensive
4. Microcontroller have no advantage of designing RAM, ROM and I/O port	4. Microprocessor have advantage of versatility such that designer can decide the amount of RAM, ROM and I/O port as needed.

Q. 12 Select the correct alternative and rewrite the following.

1. —— is a microcontroller chip.
(i) 8085 (ii) 80286 (iii) 8051 (iv) Pentium

Ans. : (iii) 8051

2. 8051 has —— RAM.
(i) 128 bytes (ii) 64K bytes (iii) 1K bytes (iv) None of these

Ans. : (i) 128 bytes

3. The 8051 microcontroller has instruction set of —— instructions. (Mar. 02, 05)
(i) 99 (ii) 111 (iii) 120 (iv) 110

Ans. : (ii) 111

4. 8051 has clock upto —— frequency. (Oct. 05)
(i) 12 MHz (ii) 4 MHz (iii) 9 MHz (iv) 6 MHz

Ans. : (i) 12 MHz

5. The 8051 is a —— generation microcontroller. (Oct. 02)
(i) First (ii) Second (iii) Third (iv) Fourth

Ans. : (ii) Second

6. The 8051 microcontroller has an ALU of —— bit capacity. (Oct. 03)
(i) 8 (ii) 16 (iii) 32 (iv) 64

Ans. : (i) 8

7. —— is not a characteristic feature of 8051 microcontroller. (Mar. 04)
   (a) 4 kbyte of internal RAM
   (b) 4 kbyte of internal ROM
   (c) 4 parallel bi-directional I/O port
   (d) Full featured serial port.

Ans. : (a) 4 kbyte of internal RAM

8. —— IC consists of internal RAM. (Mar. 06)
   (i) 8080 (ii) 8085 (iii) 8051 (iv) 8086

Ans. : (iii) 8051

9. 8051 Microcontroller IC have —— number of 8 bit I/O ports. (Oct. 06)
   (i) 1 (ii) 2 (iii) 4 (iv) 8

Ans. : (iii) 4

10 The 8051 microcontroller has an ALU of _______ bit capacity. (Oct. 2003)
   (i) 8 (ii) 16 (iii) 32 (iv) 64

Ans. : (i) 8

11. ______ is not a characteristic feature of 8051 microcontroller. (March 2004)
   (a) 4 kbyte of internal RAM
   (b) 4 kbyte of internal ROM
   (c) 4 parallel bidirectional I/O port
   (d) Full featured serial port.

Ans. : (b) 4 kbyte of internal RAM

12. 8051 micro-controller has instruction set of ______ (March 2005)
   (i) 99 (ii) 111 (iii) 120 (iv) 110

Ans. : (ii) 111

13. Intel 8051 has clock upto ______ frequency. (Oct. 2005)
   (i) 12 MHz (ii) 4 MHz (iii) 9 MHz (iv) 6 MHz

Ans. : (i) 12 MHz

14. ____ IC consists internal RAM. (March 2006)
   (i) 8080 (ii) 8085 (iii) 8051 (iv) 8086

Ans. : (iii) 8051

15. 8051 Micro-controller IC has _____ number of 8 bit I/O ports. (Oct. 2006)
   (i) 1 (ii) 2 (iii) 4 (iv) 8

Ans. : (iii) 4

16. Among following ___ is the latest 8-bit single chip microcontroller. (March 2007)
   (i) 8048 (ii) 8051 (iii) 8096 (iv) 8044

Ans : (ii) 8051

17. In 8051 size of internal ROM is __________. (Oct. 2007)
   i) 4KB ii) 2KB iii) 8KB iv) 16KB

Ans : (i) 4KB

18. The 8051 internal ROM is ———. (March 2008)
(i) Found in the Data Memory Space
(ii) Used to store variable program data
(iii) 4 kBytes of ROM in the Program Memory Space
(iv) All of the above

Ans : a) 4 kBytes of ROM in the Program Memory Space

19. which of the following is not a part of an 8051 Single-chip Microprocessor ? (Oct. 2008)
(i) A 4-kbyte ROM (ii) Dual Serial Port
(iii) A 128 –byte RAM (iv) Four 8-bit parallel I/o ports

Ans : (ii) Dual Serial Port

20. The additional feature of 8051 Microcontroller over 8085 Microprocessor is that, it has additional ________. (March 2009)
(i) Internal RAM only (ii) Internal ROM only
(iii) 16 bit ALU (iv) Both Internal RAM and ROM

Ans. (iv) Both Internal RAM and ROM

21. Internal program memory of 8052 Microcontroller is ______ (Oct. 2009)
(i) 4 k byte (ii) 8 k byte (iii) 256 k byte (iv) 64 k byte

Ans. : (ii) 8 k byte

22. In case of 8051 Microcontroller Chip, there are _____ external interrupts. (Oct. 2010)
(i) 3 (ii) 2 (iii) 4 (iv) 5

Ans : (ii) 2

23. In 8051, 22 special function registers occupy memory space from ______ (March 2011)
(i) 08H to F8H (ii) 80H to F8H (iii) 80 to 8FH (iv) None of those

Ans : (ii) 80H to 8FH

24. Micro-controller 8051 have _______ .External Interrupts. (Oct. 2011)
(i) 1 (ii) 2 (iii) 3 (iv) 4

Ans.: (ii) 2

25. _______ is a characteristic feature of 8051 Micro-controller. (March 2012)
(i) Four 8 bit I/O Ports (ii) Two 8 bit I/O Ports
(iii) 4kB RAM (iv) Four External Interrupts

Ans.: (i) Four 8 bit I/O Ports

26. Micro-controller 8052 has ______ external interrupts. (Oct. 2012)
(i) 2 (ii) 3 (iii) 4 (iv) 5

Ans. : (ii) 3

27. _____ is Microcontroller chip. (March 2013)
(i) 8065 (ii) 8086 (iii) 8051 (iv) Pentium

Ans. : (iii) 8051

28. Micro-controller 8050 has ________ bytes of RAM **(Oct. 2013)**
(i) 64 (ii) 128 (iii) 256 (iv) 32
Ans. : (iii) 256

29. Internal Data memory of 8051 microcontroller is __________ . **(March 2014)**
(i) 128 bytes (ii) 128 k bytes (iii) 256 bytes (iv) 4 k bytes
Ans. : (i) 128 bytes

30. ________ is not a Micro-controller. **(Oct. 2014)**
(i) 8052 (ii) 8032 (iii) Pentium (iv) 8051
Ans. : (iii) Pentium

31. 8051 _____ Bit Micro-Controller. **(Oct. 2015)**
(i) 8 (ii) 4 (iii) 16 (iv) 32
Ans. : (i) 8

32. ______ is a Micro-Controller. **(March 2016)**
(i) 8086 (ii) 8051 (iii) 8088 (iv) 80286
Ans. : (ii) 8051

33. _____ is a Microcontroller Chip. **(July 2016)**
(i) 8080 (ii) P-IV (iii) 8052 (iv) 8086
Ans. : (iii) 8052

34. Intel 8051 Microcontroller has _______ RAM. **(July 2017)**
(i) 128×8 (ii) $4K \times 8$ (iii) 64×8 (iv) $8K \times 8$
Ans. : (i) 128×8

35. The instruction set of intel 8051 micro-controller contains total ______ instruction. **(March 2018)**
(i) 111 (ii) 72 (iii) 74 (iv) 100
Ans. : (i) 111

36. __________ is a microcontroller. **(July 2018)**
(i) Intel 8085 (ii) Intel 8086
(iii) Intel 8052 (iv) Intel 8008
Ans. : (iii) Intel 8052

37. The 8081 Micro-controller has instruction set of _______ instructions. **(March 2019)**
(i) 101 (ii) 110 (iii) 99 (iv) 111
Ans. : (iv) 111

38. 8051 Microcontroller IC have _______ number of 8 bit I/O ports. **(July 2019)**
(i) 1 (ii) 2 (iii) 4 (iv) 8
Ans. : (iii) 4

39. The 8051 Micro-controller pan address _______ program memory. **(March 2020)**
(i) 8 k byte (ii) 16 k byte (iii) 32 k byte (iv) 64 k byte
Ans. : (iv) 64 k byte

□□□

Chapter 5 Networking Technology

Probable marks : 28

Scope of the syllabus :-

- Study of transmission media :
  Cable media-coaxial cable, Twisted pair, fibre optic, their comparison.
  Introduction to wireless media.
- Network topologies - Access methods, Topologies (BUS, RING, STAR), Ethernet, TOKEN RING.
- Protocols - Internet protocols
- Introduction to connectivity devices
- Modem, Hubs, Repeaters, Routers

Study of transmission media

Q. 1 What is transmission media? Give transmission media characteristics.

(Oct. 2007; July 2018)

OR List 'six' characteristics of transmission media. (Dec. 2020)

Ans. :

(1) The pathways through which individual systems are connected in a network are called as transmission media.

(2) Transmission media makes transmission of electronic signals possible from one computer to another. These electronic signals are nothing but binary pulses (I/O).

(3) Each type of transmission media has special characteristics that make it suitable for a specific type of service.

(4) The characteristics are : (March 2019)

1. Cost of media
2. Installation requirement
3. Bandwidth
4. Band usage (base band and broad band)
5. Attenuation
6. Immunity from electromagnetic interference.

Q. 2 What is Wireless Media ? Write any two advantages of Wireless Media.

(March 2017; July 2018)

Ans. : Wireless communication has extra ordinary convenience. Not all network are connected with cabling. Some network are wireless. The technology is expanding to offer better options for wireless network. There are three basic types of wireless network. 1. Wireless LAN 2. Extended LAN 3. Mobile computing.

For Advantages of Wireless Media : Please refer Chapter 5 Q. 3, Pg. No. 5-2.

Q. 3 What is a Transmission Medium ? What are the advantages of wireless transmission ? **(Oct. 2004; July 18)**

Ans. : Transmission medium : Refer Q. No. 1.

Advantages of wireless medium :

(1) High data rates by using large bandwidth.

(2) Wireless medium can give transmission speed around 24 kbps.

(3) By this media the communication can reach rural and hilly area.

(4) Bandwidth for digital data 1 to 10 Mbps.

Q. 4 Explain the following characteristics of transmission media. **(March 2002, 08 Oct. 2005, 06, 10, 21; July 2019)**

(a) Bandwidth (b) Band usage (c) Attenuation

(d) Immunity from electromagnetic interference.

Ans. :

(a) Bandwidth : **(March 2020)**

(1) Bandwidth is the measure of the capacity of a medium to transmit data.

(2) Data transmission rates is number of bits transmitted per second.

(3) Bandwidth of a cable depends on cable length.

(4) A short cable can have greater bandwidth than a long cable so for all cable designs, maximum lengths for cable runs are specified.

(5) Beyond these limits the highest frequency signals can deteriorate and error occurs in data signals.

(b) Band usage : **(March 2009)**

(1) The bandwidth is shared so that maximum usage is obtained.

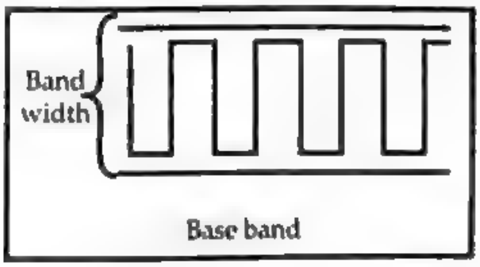
(2) There are two transmission modes, base band and broad band transmissions.

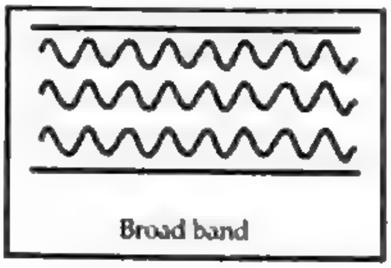
(3) Base band devotes the entire capacity of the medium to one communication channel.

(4) Broad band enables two or more communication channels to share the bandwidth of communication medium.

(5) Base band is most common mode of operation. Most local area networks (LAN) function in base band mode. In base band, signaling can be anolog or digital.

(6) The base band and broad band transmission modes are shown in following figure :-





(c) Attenuation : **(March 2009, 2020,Oct. 2005)**

(1) Attenuation is a measure of how much a signal weakens as it travels through a medium.

(2) As signals pass through the medium, part of the signal is absorbed and makes the signal weak.

(3) Attenuation decides the cable length when signal strength falls below certain limits, then at receiving station noise may appear.

(4) Repeaters are used to regenerate signals.

(d) Immunity from electromagnetic interference (EMI) : **(March 2009, Oct. 2005,2010)**

(1) Electromagnetic interference consist of outside electromagnetic noise that distorts the signal in a medium.

(2) EMI is interfering the signals and makes difficult for computers to decode the signal.

(3) An example of electromagnetic interference is the crosstalk. Crosstalk occurs when the signal from one wire is picked by another wire.

(4) In computer networks, large number of cables are located close together, therefore crosstalk is a significant problem in networks.

Q. 5 Explain the following characteristics of transmission media :
(a) Cost (b) Installation requirements.

Ans. :

(a) Cost of media : **(Oct -2010)**

(1) One major factor in purchase decision of any networking component is its cost.

(2) For a new fast technology, cost is also more expensive.

(3) Decision depends upon application and standard of the resources.

(4) Therefore, the network designer must settle for something, which is cheaper and robust.

(b) Installation requirement : **(March 2020)**

(1) Some transmission media requires skilled labour to install. This increases cost of network and it may cause certain delay.

(2) Before installation we need to prepare actual physical layout of network.

Q. 6 Explain in short the six important characteristics of transmission media.
(March 2004, 20, Oct -2010; July 18)

Ans. : Each type of transmission media has special characteristics that make it suitable for a specific type of service. The characteristics are :

i) Cost of media

ii) Installation requirement

iii) Bandwidth

iv) Band usage

v) Attenuation

vi) Immunity from electromagnetic interference.

i) Cost of media :

(a) While designing a network, the cost of media must be considered.

(b) The cost property is decided by user as per application and standard of resources.

ii) Installation requirement :

(a) Before installation, prepare actual physical layout of network and then estimate cable and cost of installation.

(b) For almost all media, the cost of installation exceeds than the cost of the able itself.

iii) Bandwidth :

(a) Bandwidth is the measure of the capacity of a medium to transmit data.

(b) Bandwidth of a cable depends on cable length.

iv) Band usage :

(a) In baseband transmission mode, baseband devotes the entire capacity of the medium to one communication channel.

(b) In broadband transmission mode, broadband enables two or more communication channels to share the bandwidth of communication medium.

v) Attenuation :

(a) Attenuation is a measure of how much a signal weakens as it travels through a medium.

(b) As signals pass through the medium, part of the signal is absorbed and makes the signal weak.

vi) Immunity from electromagnetic interference (EMI) : (March 2020)

(a) Electromagnetic interference consist of outside electromagnetic noise that distorts the signal in a medium.

(b) EMI is interfering the signals and makes difficult for computers to decode the signal.

Q. 7 What are the advantages of computer networks ? Distinguish between LAN and WAN ? (March 2003, 06, 11, 19, Oct. 2005, July 17, 18)

Ans. :

(1) Computer network is an interconnected collection of autonomous computers or system of computers capable of sharing resources controlling services.

(2) The main advantages of computer network are :

a) Network provides resource sharing.

b) It provides exchange of information and software.

c) It provides high reliability by using other machine if one machine fails in the network like military banking, air and traffic control.

d) Access to any file and data.

e) Finally the system is saving money by network only.

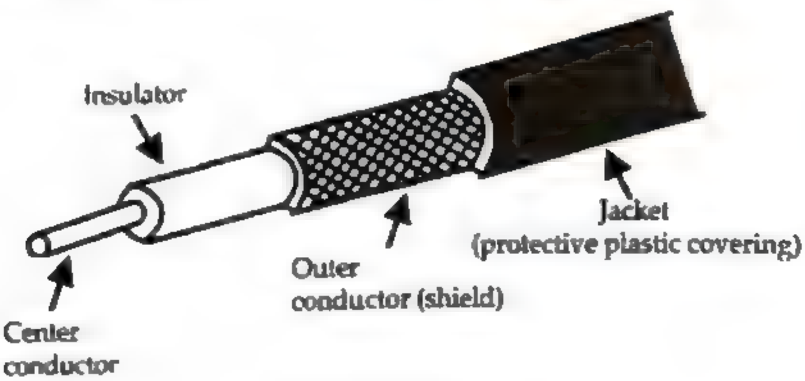
(3) The differences between WAN and LAN are as follows :

	WAN	LAN
1.	A WAN (Wide Area Network) is the interconnection of LAN or MAN can be located entirely within a state, country or around the world.	A LAN (Local Area Network) is a group of computers interconnected within a small area such as room, building or a campus.
2.	Data transfer rate is comparatively slower such as in Kbits/sec. 10 million bits per second.	Data transfer speed is comparatively high such as thousand bits per second to
3.	In WAN, links may be established by using telephone cable or microwave towers or satellite.	Co-axial cables are generally used to connect the computer and other devices.
4.	In this network, shortcircuit errors, noise errors, atmospheric errors are higher than any other networks.	Due to short distance, short circuit errors or other noise errors are minimum.
5.	For example : pager.	For example : A computer lab in a college.

Q. 8 Describe co-axial cable in detail. OR
Write a short note on Co-axial cable with suitable figure. **(Mar. 2003, Oct. 2006, 2010)**

Ans. :

(1) In co-axial cable, there are two conductors sharing a common axis.
The co-axial cable is shown in following fig.



Co-axial cable

(3) The components of co-axial cable are as follows :

(a) A center conductor is a solid copper wire or stranded wire.

(b) An outer conductor form a tube surrounding the inner conductor. This conductor is made up of braided wires, metallic foil or both. The outer conductor is called as shield. This serves as a ground and protects inner conductor from EMI.

(c) An insulator layer keeps outer conductor spaced evenly from the inner conductor.

(d) A plastic jacket protects cable from damage.

(4) There are two types of co-axial cables :

(a) Thin net (thin, flexible and inexpensive)

(b) Thick net (thick, hard and expensive)

Advantages :

(1) The co-axial cable is better shielded than the twisted pair cable. So, it can span longer distance at higher data transmission speed.

(2) Its shielding provides better resistance to EMI.

(3) Attenuation is less than twisted pair cable

Disadvantages :

(1) It is relatively more expensive than Twisted Pair but less than fiber optic cable.

(2) Bandwidth capacity is comparatively less than fiber optic cable.

Q. 9 Give the important characteristics of co-axial cable. (March 2022)

Ans. :

The important characteristics of co-axial cable are given below.

i) **Cost :** Thinnet cable is low cost cable, it costs less than STP. Thicknet cable more than STP.

ii) **Installation :** Co-axial is easy to install. Installation of thinnet cable is also inexpensive.

iii) **Capacity :** LANs based on co-axial cable gives bandwidth, in between 2.5 Mbps to 10 Mbps. Thicknet co-axial cable gives higher bandwidth.

iv) **Attenuation :** Due to attenuation thinnet co-axial cable can transmit signal reliably upto 185 meters, where as thicknet cable can run upto 500 meters.

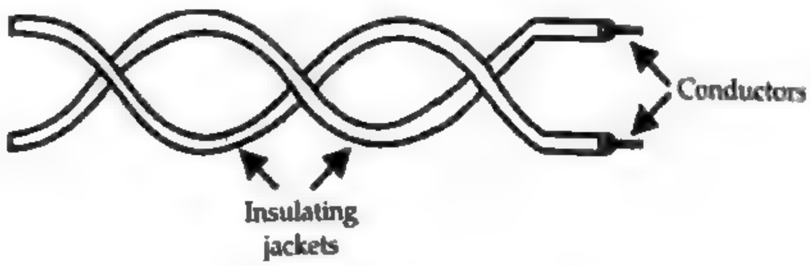
v) **EMI :** As co-axial cable consists of central copper conductor, it is sensitive to EMI, but shielding reduces its sensitivity to EMI. Co-axial cable is less sensitive to EMI than UTP cable.

Q. 10 Explain Twisted pair cable in detail. OR
Write a note on Twisted pair cable. (March 2009, Oct. 2004)

Ans. :

(1) Twisted pair cable consist of two wires of conducting material like copper, insulated from each other by plastic.

(2) The basic Twisted pair cable is shown in fig.



Twisted pair cable

(3) It consists of two or more strands of copper wire twisted together.

(4) This twisting reduces the sensitivity of the cable to EMI (electromagnetic interference) and also reduces the tendency of the cable to radiate radio frequency noise.

(5) This cable is used to connect a PC to either HUB or MAU. Also commonly used in telephone network.

(6) Twisted pair cables are of two types :

(a) Shielded Twisted pair cable (STP)

(b) Unshielded Twisted pair cable (UTP)

(a) Shielded Twisted pair (STP) :

(i) Shielded Twisted pair cable consist of one or more twisted pairs of cables enclosed in a foil wrap and woven copper shielding.

(ii) The shield is connected to the ground portion of the electronic device to which cable is connected. Ground portion is electrical reference point.

(iii) A properly grounded shield prevents signals from getting into or out of the cable.

(b) Unshielded Twisted pair (UTP) :

(i) The unshielded Twisted pair does not have a braided shield into its structure. The characteristics of UTP are similar to that of STP.

(ii) Telephone systems commonly use UTP cable. In some networks UTP cable is used. UTP cable is available in 5 grades or categories.

(7) Advantages :

(i) This medium is inexpensive and easy to install.

(ii) Since wires are twisted, it reduces EMI and also avoids RF radiation.

(iii) Twisted wires also reduce cross talk.

(8) Disadvantages :

(i) They can be used only for short distance communication.

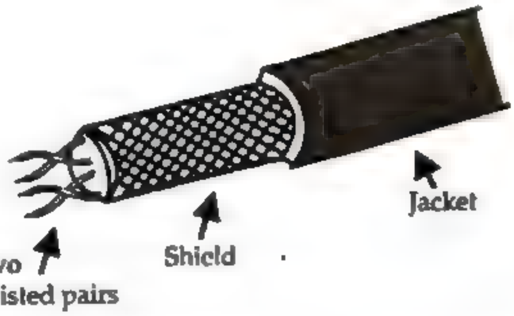
(ii) The typical speed of computer data is 1200 bits/seconds (bps).

Q. 11 Write a note an shielded twisted pair cable with its characteristics.

Ans. :

(1) Shielded Twisted pair cable consist of one or more twisted pairs of cables enclosed in a foil wrap and woven copper shielding.

(2) Following fig. shows IBM type 1 of shielded twisted pair cable :



(3) The shield is connected to the ground portion of the electronic device to which cable is connected. Ground portion is electrical reference point.

(4) A properly grounded shield prevents signals from getting into or out of the cable.

(5) The characteristics of shielded Twisted pair cable are given below :

(i) **Cost :** The cost of STP cable is more than that of co-axial or UTP cable. Its cost is less than that of thick co-axial or fibre optic cable.

(ii) **Installation :** The installations required for STP cable depends upon the type of network. As per the type of network, different connectors are used.

(iii) **Capacity :** STP cable has a theoretical capacity of 500 MBPS. Practically it is around 155 MBPS with 100 meter cable run. The most common data rate for STP cable is 16 MBPS.

(iv) **Attenuation :** All Twisted pair cables have attenuations. This limits the length of cable. 100 meter limit is most common.

(v) **EMI characteristics :** The shield in STP cable results in good EMI characteristics. STP cable has low sensitivity towards electromagnetic interference.

Q. 12 Write a short note on unshielded twisted pair cable with its characteristics. **(Mar. 2002)**

Ans. :

(1) UTP consists of a number of twisted pair with plastic jacket.

(2) It is commonly used in telephone systems. Now-a-days UTP cable is being used in LAN instead of co-axial cable.

(3) A UTP cable is shown in following figure :

(4) The characteristics of Unshielded Twisted pair cable are given below:

(i) **Cost :** UTP cable is cheaper than any other cable. The cost of category 5 twisted pair cable is high.

(ii) **Installation :** UTP cable is easy to install. The equipments required are also low cost. UTP system can be easily reconfigured.

(iii) Capacity : For UTP cable data rate capacity upto 100 MBPS can be achieved.

(iv) Attenuation : UTP cable has similar attenuation characteristic as that of other copper cables. UTP cable run is restricted to few hundred meters. 100 m is most common limit.

(v) EMI : UTP cable does not have shield. Hence it is more sensitive to EMI than co-axial or STP cable. Using latest technology, noise can be avoided.

Q. 13 Differentiate between UTP and STP cable. (Oct. 2009, July 2019)

OR Compare the characteristics of UTP Cable and STP Cable. (March 2022)

Ans. :

	UTP cable	STP cable
1.	UTP consists of a number of twisted pairs with plastic jacket. jacket and pairs.	STP also consists of a number of pairs but a shell usually aluminium or polyster between
2.	Inexpensive and easy to install.	Expensive than UTP and difficult to install.
3.	Bandwidth capacity is from 1 to 100 Mbps upto 100 mtrs.	It is 10 to 155 Mpbs upto 100 mtrs.
4.	More attenuation and sensitive to EMI.	Less attenuation and EMI is reduced to shielding.
5.	Used in telephone system.	STP is used in LAN
6.	Maximum number of nodes 1024.	Maximum number of nodes are 270.

Q. 14 Write a short note on fibre optic cable. (March 2018)

Ans. :

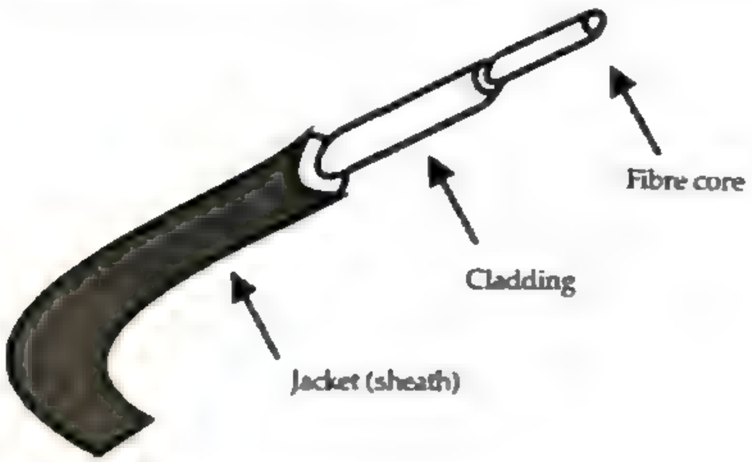
(1) The light wave can be efficiently conducted through transparent glass fiber cables known as optic fiber cables.

(2) The centre conductor of this cable is a fibre that consists of highly refined glass or plastic.

(3) It is designed to transmit light signals with little loss.

(4) The fibre is coated with cladding or gel that reflects signals back into fibre to reduce signal loss. A plastic sheet protects the fibre from damage.

(5) The fibre optic cable is shown in following figure :



(6) This cables can carry much information at a time.

(7) The fibre optic cable is used in optical transmission system.

(8) This cable have extremely high bandwidth. It has zero sensitivity to EMI and runs over several kilometers.

OR Explain any three characteristics of fiber optic cable. (Oct. 2021)

Ans. :

(9) The characteristics of fibre optic cable are given below :

- **(i) Cost :** The cost of fibre optic cable is more than that of co-axial cable and Twisted pair cable.
- **(ii) Installation :** Fibre optic cable requires skilled installation. Every cable has minimum bend radius. They may get damaged if bent sharply Fibre optic cable can not be stretched.
- **(iii) Capacity :** Fibre optic cable supports high data rates (upto 2,00,000 MBPS), even with long run cables. Fibre optic cable can transmit 100 MBPS for several kilometer.
- **(iv) Attenuation :** Attenuation for fibre optic cable is much lower than co-axial cable and twisted pair cable. It can run to larger distance.
- **(v) EMI :** Fibre optic cable does not use electrical signals to transmit data, therefore they are free from EMI. The data transfer in fibre optic cable have high security, as it can not be detected by electronic wave dropping equipments.

Q. 15 Compare any four attributes of UTP and Optical Fibre Cable.
(March 04, 09 Oct. 06, 07, 08, 2011; July 17)

Ans. :

	UTP	Optical Fibre Cable
(1) Cost	Cost of UTP cable is less than that of optical fibre cable.	Optical fibre cable are expensive.
(2) Installation	Installation of UTP cable is easy.	Optical fibre cable requires skilled
(3) Capacity	Data rate capacity is from 1 to 100 MBPS upto 100 mtrs.	Optical fibre cable can transmit 100 MBPS for several kilometers.
(4) EMI	More sensitive to EMI.	This cable has no sensitivity to EMI.
(5) Attenuation	Attenuation is more than optical fibre cable.	In optical fibre cable attenuation is very less.

Q. 16 Compare the characteristics of fibre optic cable and co-axial cable. Mention at least three points. (March 2002, Oct. 2005, 21)

Ans. :

1) **Cost :** Cost of co-axial cable is less than that of fibre optic cable. Fibre optic cables are expensive.

2) **Installation :** Installation of co-axial cable is cheaper and easier than that of fibre optic cable.

3) **Capacity :** In general data transmission capacity of co-axial cable is 10 MBPS, while that of fibre optic cable is 100 MBPS.

4) **EMI :** Co-axial cable is less sensitive to EMI, while fibre optic cable has no sensitivity to EMI.

5) **Attenuation :** It is more in co-axial cable. In optic fibre, attenuation is very less.

Q. 17 Compare the co-axial cable with Twisted pair cable. Mention atleast three points.
(Oct. 2003, 2010, March 2005)

Ans. :

	Twisted Pair Cable	Coaxial Cable
(1)	It consists of a pair of wires or one or more pairs of two twisted copper wires insulation.	It is a hallow cable with a solid copper at the center of the cable surrounded by plastic from
(2)	This is inexpensive medium.	Relatively expensive i.e. twice or thrice than twisted pair.
(3)	EMI effect is maximum.	EMI effect is minimum.
(4)	Attenuation is more than coaxial cable.	Attenuation is less than twisted pair cable.
(5)	Bandwidth capacity is from 1 to 100 Mbps upto 100 mtrs.	Bandwidth capacity is from 500 Mbps upto 100 mtrs.
(6)	They can be used only for short distance communication.	It is commonly used in network.

Q. 18 Compare the characteristics of Fiber-Optic and Co-axial Cable. Mention at least three points. **(March 2008; July 18)**

ns :

	Fiber-Optic		Co-axial Cable
	This Cable has no sensitivity to EMI	i)	EMI effect is minimum
	Optical fibre cable can transmit 100mbps for several kilometers.	ii)	Bandwidth capacity is form 500 mbps upto 100 mbps
iii)	Optical fibre are expansive.	iii)	Co-axial cable are less expensive.

Q. 19 Compare any four attributes of Coaxial thicknet Cable with UTP cable. **(June 2016)**

Ans. :

	Coaxial Thicket cable		UTP Cable
1.	More expensive.	1.	Less expensive.
2.	Difficult to install.	2.	Easy to install.
3.	Bandwidth upto 500 meters	3.	Bandwidth upto 100 meters.
4.	Attention less.	4.	Attention more.
5.	Less sensitive to EMI.	5.	More sensitive to EMI.
6.	Used in LAN.	6.	Used in telephone system

Q. 20 Explain the following wireless media in detail. OR State and explain different networking media. Explain any two wireless media. **(Oct. 2005)**

Ans. :

(I) Radio waves :

(1) Radio waves are easy to generate. They can travel long distance and can penetrate buildings easily. Hence, radio waves are widely used for both indoor and outdoor purposes.

(2) Radiowaves are omnidirectional i.e. the waves travel in all directions, in the free space so that there is no need to place the receiver or transmitter along a direct line of sight.

(3) Radio wave communication have variety of frequency ranges that are utilised for various communication applications.

(4) As radiowaves covers large distance, interfare between users is a problem. For this reason government license is necessary to transmit radiowaves.

(5) Radio communication having major drawback that it may be disturbed by rains, bounce back from obstacles. It offers low bandwidth for data communication.

(II) Microwaves :

(1) Microwaves travels in straight lines and therefore narrowly focused, concentratin all the energy into beam.

(2) For microwaves transmitting and receiving antennas should be accurately alligned This directionality allows multiple transmitters linear in a row to communicate with multiple receivers linear in a row without interference.

(3) Since, microwaves travels in straight lines, for longer distances periodic repeaters are necessary.

(4) Unlike radiowaves, at lower frequency microwaves can not penetrate buildings.

(III) Infrared and millimeter waves :

(1) Unguided infrared and millimeter waves are widely used for short range communication.

(2) The remote controls used on television, V.C.Rs. etc. all used infrared communication.

(3) They are relatively directional, cheap and easy to generate. Major drawback of these waves is that they can not pass through solid objects.

(4) As infrared waves can not pass through solid objects, it means that an infrared system operating in one room will not interfare with other infrared system operating in adjacent room or any other room. For this reason, no government license is necessary to operate infrared system.

Q. 21 State four LAN wireless transmission methods. Explain any two of them. **(Oct. 2003)**

Ans. : Wireless LAN can use one of the transmission method :

(i) Infrared (ii) Laser

(iii) Narrow – band radio (iv) Microwave

(i) Infrared :

(a) In infrared transmission infrared rays are used.

(b) This is limited within 100 feet.

(c) Upto 10 Mbps bandwidth can be supported.

(d) Remote control of TV uses infrared transmission.

(ii) Laser :

(a) In laser transmission LASER rays are used.

(b) This receiver and transmitter are in straight of sight.

(c) This can be used for LAN and WAN transmission.

(iii) Narrow-band radio :

(a) In narrow-band radio transmission, a single frequency is used for transmission.

(b) The receiver and transmitter need not to put along a direct line of sight.

(c) The range of narrow band is greater than infrared.

(iv) Microwave :

(a) Microwave communication can take two forms : Terrestrial links and satellite links.

(b) In terrestrial microwave communication the transmitter and receiver are earth based.

(c) Telephone relay towers uses this type of communication.

(d) In satellite microwave system, satellite are 22300 mils above the earth

(e) Earth stations uses satellite dishes to communicate with satellite.

[Note : Explain any two types]

Network topologies

Q. 22 What do you mean by network topology ? Explain in brief the two basic categories of topology. **(March 2004,Oct.2009, March 2020**

Ans. :

(1) Topology refers to the way in which network of computers is connected.

(2) A topology defines the arrangement of nodes, cables and connectivity devices that make up the network.

(3) There are two categories :

(i) Physical topology (ii) Logical topology

(4) Physical topology describes actual layout of the network transmission media. It defines the way the network looks.

(5) Logical topology describes the logical pathway a signal follows as it passes among the network modes. It defines the data passes among the nodes.

(6) Physical and logical topologies can take several forms.

The most common are :

(a) Bus topologies (b) Ring topologies

(c) Star topologies (d) Mesh topologies

Q. 23 What is topology ? Explain BUS topology in detail.

(Oct. 2006, 2007, 2009, 2010, March 2011)

OR Explain with diagram 'BUS topology'. Mention it's two advantages and two disadvantages. **(Dec. 2020)**

Ans. :

(1) Topology refers to the way in which network of computers is connected.

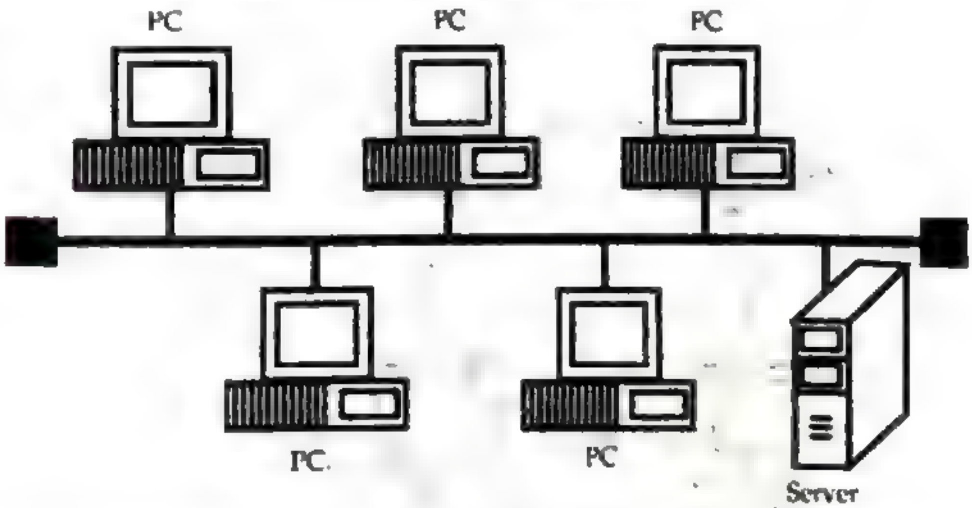
(2) Nodes in the network are physically interconnected in some configuration to provide efficient communication. This configuration is called as topology.

(3) A topology defines the arrangement of nodes, cables and connectivity devices that make up the network.

BUS topology :

(1) In a BUS physical topology, all the devices are connected to a common shared cable, called as backbone of the network.

(2) A BUS physical topology is shown in following figure :



(3) The bus is available for each node to send its data to each and every computer node.

(4) Most of the buses transmits signals in both directions on backbone cable and hence all workstations are able to receive signals. But some buses are unidirectional and data is transmitted only in one direction of backbone cable. Hence only down stream devices can receive signals.

(5) The backbone cable carries transmission message along the cable. As message arrives at a workstation, it checks whether the destination address matches to its own or not. If not, it does no more and the message goes to next workstation.

(6) The bus cable is terminated at each end by placing terminators to prevent signals from reflecting back.

(7) The commonly used implementation for BUS topology is ethernet at 10 MBPS.

(8) Advantages :

(i) The bus system is much faster.

(ii) The bus topology can be extended with sub branches to form another topology.

(iii) Breakdown of any failure node does not affect other node's communication.

(iv) Bus topology is widely used in LAN network.

(9) Disadvantages :

(i) Bus topology is not great for large networks.

(ii) If a main cable is damaged, whole network fails.

(iii) Identification of problem become difficult is whole network goes down.

(iv) This network topology is very slow as compared to other topologies.

Q. 24 Explain RING topology. Give its advantages and disadvantages.

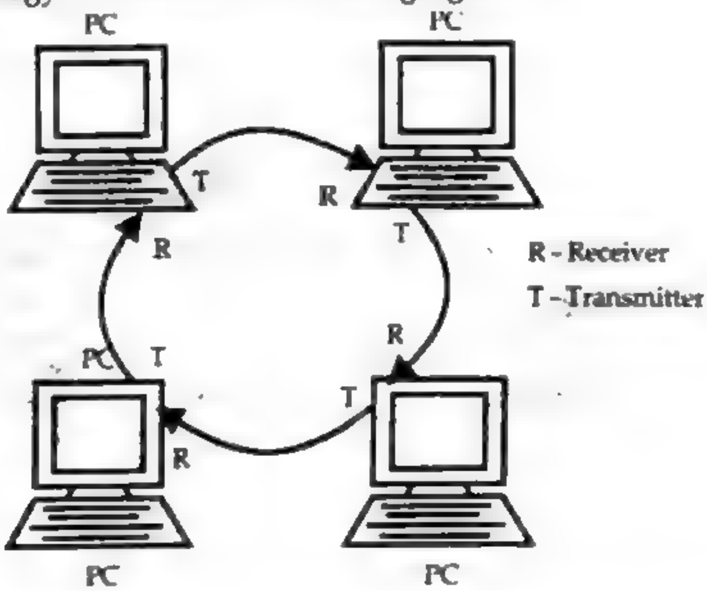
(March 09, 18, July 2019)

Ans. :

(1) RING topologies are wired in a circle. Each node is connected to its neighbours on either side, and the data transmits along the ring in one direction only.

(2) Each device incorporates a receiver and a transmitter and serves as a repeater that passes the signal onto the next device in the ring.

(3) The RING topology is as shown in following figure :



(4) RING topologies are suited for networks that uses token passing access methods. The token passes around the ring, and the only node that holds the token can transmit data.

(5) This topology is always implemented as a logical topology.

e.g. In token ring network, the topology is physically a STAR topology. But logical topology is RING topology.

(6) The commonly used implementation for RING topology is token ring at 4-16 MBPS.

(7) **Advantages :**

(i) Cable failure affects limited users.

(ii) Each node has equal access speed to the ring.

(iii) Equal access for all users.

(8) **Disadvantages :**

(i) Costly wiring is required for RING topology.

(ii) Expensive adapter cards.

(iii) Difficult connections.

Q. 25 Explain in short, STAR topology. (March 2006, 11, 18, 19, Oct. 2007; July 2019)

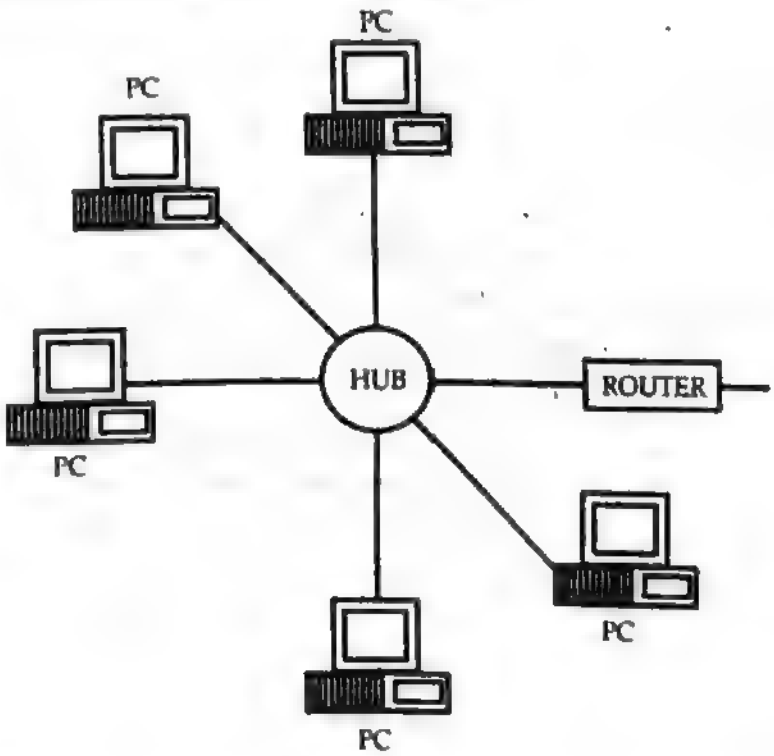
Ans. :

(1) In a STAR topology all the workstations are connected to central hub.

(2) The hub receives signal from a workstation and routes it to the proper destination.

(3) STAR physical topology is often implemented to implement BUS or RING logica topology.

(4) A STAR topology is shown in following figure :



(5) **Advantages :**

(i) Adding a new workstation is easier than that in BUS or RING topology.

(ii) The control is centralised due to use of hub.

(6) Disadvantages :

(i) Hub failure affects all users.

(ii) Hubs are slightly expensive.

(iii) STAR topology requires more cabeling than BUS or RING topology. Hence, it costs more.

Q. 26 What are Network Topologies ? Explain the commonly used topologies with appropriate diagrams. (Mar.2010, Oct. 2004)

Ans. : Topology : Please refer to Q. No. 23.

Commonly used topologies are :

(i) Bus topology (ii) Ring topology (iii) Star topology

For description refer to Q. No. 23, 24, 25.

Q. 27 Define topology. Explain Star and Ring Topology. (March 2002, March 2005)

Ans. : Topology : Refer to Q. No. 23,

Ring Topology : Refer to Q. No. 24,

Star Topology : Refer to Q. No. 25.

Q. 28 Define Bus, Ring and Star topologies. Draw simple diagram for each. (March 2003, Oct. 2002, 2008)

Ans. : Please refer Q. 20, Q. 21, Q. 22.

Q. 29 Define Bus, Ring and Star Topologies. Draw simple diagram for each. (March 2013)

Ans. :

(1) Bus Topology : The topology in which all devices are connected to a common shared cable called backbone of the network is called bus topology.

(2) Ring Topology : The topology which are wired in a circle and each node of it is connected to its neighbours on either side and the data transmits along the ring in one direction only is called as ring topology.

(3) Star Topology : The topology in which all the work stations or PC are connected to central hub and hub routs signal to proper destination is called as star topology.

Note : For diagram of Bus, Ring, and star topology refer Q. 23, 24 and 25 respectively.

Q. 30 Which networking topology is best? Why? Explain. (March 2007)

Ans. :

i) STAR network topology is best.

ii) In star topology, one computer acts as a main central computer to which all other computers are connected.

iii) That main computers may be hub sometimes, It receives signals from other computers and transmits to the proper destination by checking its address.

iv) The routine function me. Ans deciding actual path of traveling of signals, is performed by main computer.

v) Reconfiguration is easy, as computer is needed to connect directly to the server. But to make each connection, long cable is needed.

vi) In star topology all process is done only through the central computer. So if central computer tails, whole network is damaged.

vii) Any failure of anyone connection doesn't affect the total network.

viii) Advantages:

i) Adding a new workstation is easier than that in BUS or RING topology.

ii) The control is centralised. due to use of hub.

Q. 31 Discuss in detail Ethernet, with ethernet terminology. OR
Write a note on Ethernet.

(March 2003, 2005, Oct. 2008; March 2017; June 2016; July 2017)

Ans. :

(1) Ethernet is a local area network technology, with networks tradionally operating within single building.

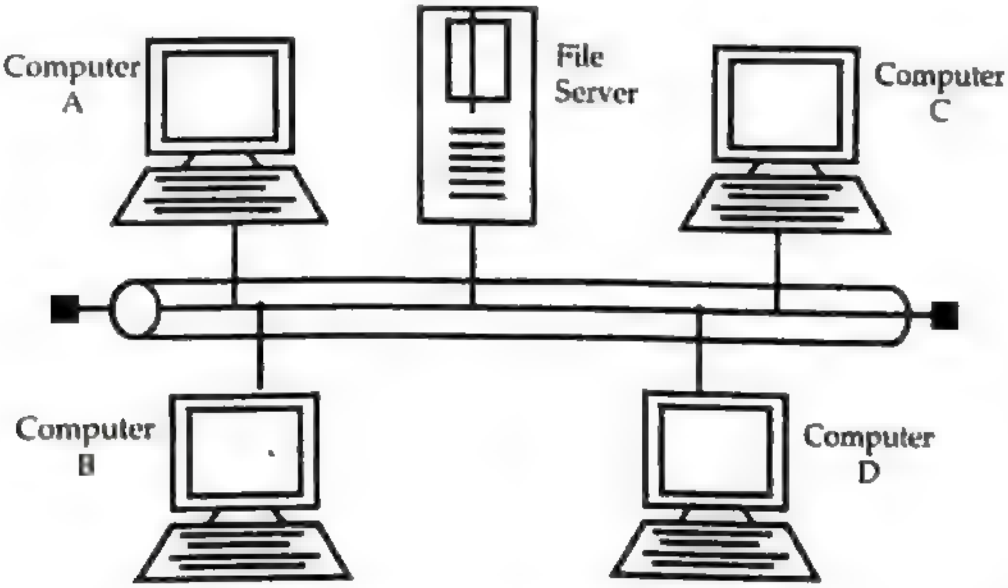
(2) Atmost, Ethernet devices can have a few hundred meters of cable between them. Modern technology allows Ethernet to span upto 10 kms.

(3) Ethernet devices are connected to a common shared medium that provides the path along which the electronic signals will travel. Historically, this medium was co-axial cable. But, now-a-days twisted pair cable or fibre optic cable are also used.

(4) Ethernet network transmit data in small units called **frames.**

(5) Each frame must contain source address as well as destination address, which identifies receipant and sender of message. The address will uniquely identify node. No two Ethernet devices can have same address.

(6) Ethernet network is as shown in following figure.



In above figure when computer A sends message to computer C, computers B and D will also get the message and check whether the destinations address matches to its own address or not, if not, it will discard the frame.

Q. 32 Explain token ring network in detail.

Ans. :

(1) Token ring network was originally developed by IBM and it is almost identical and compitable to IBM.

(2) Token ring uses token passing architecture. The topology is physically a STAR. But it uses logical ring to pass the token.

(3) Each token ring network device is connected to a central concentrator, called as multistation access unit (MSAU or MAU). Because of MSAU, a single computer failure will not take the entire LAN down.

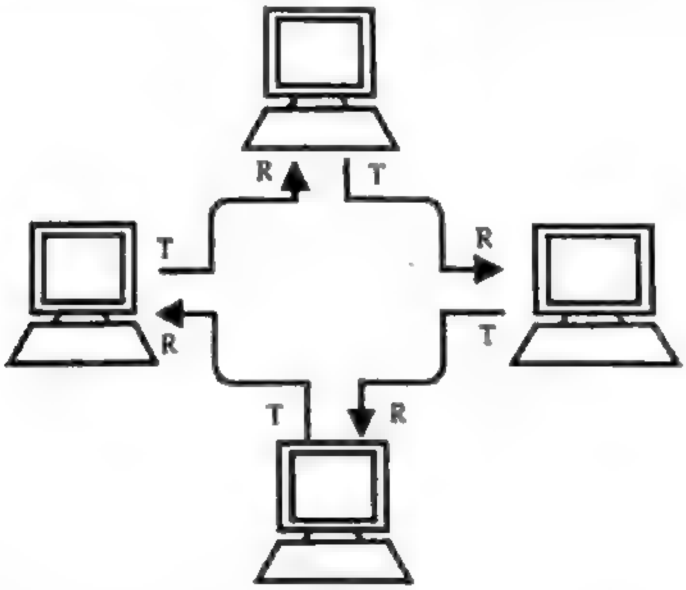
(4) Token passing networks moves a small frame, called token around the network.

(5) The node which passes token have right to send information.

(6) If the node possessing token has no information to send, then it passes token to next node. Each node can hold token for maximum period of time.

(7) If the node possessing token does have information to send, then it sends it to next workstation (node), which checks whether information belongs to it or not, if not, then sends it to next node. The information frame circulates the ring until it reaches to the destination.

(8) While the information frame is circulating, no token is on the network, which means that other nodes must wait to transmit.



Q. 33 Explain the ring topology and token passing. (Mar. 2008, Oct. 2003, 2007)

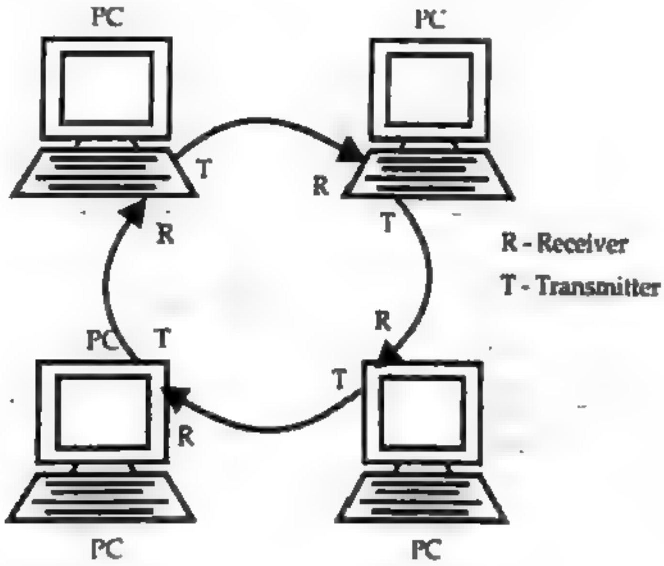
Ans. :

I Ring Topology :

(1) RING topologies are wired in a circle. Each node is connected to its neighbours on either side and the data transmits along the ring in one direction only.

(2) Each device incorporates a receiver and a transmitter and serves as a repeater that passes the signal onto the next device in ring.

(3) The RING topology is as shown in following figure :



ii) **Token passing :**

1) Token passing utilizes a frame called a token, which circulates around the network.
2) A computer that needs to transmit must wait until it receives the token.
3) When computer receives token, it is permitted to transmit.
4) When computer completes transmitting, it is passes the token frame to the next station or token ring network.

Q. 34 Discuss access methods of networking. OR Discuss any two access methods of networking ? (March 2003, 2020, Oct. 2009)
OR Explain the following access methods brief. (Oct. 2002, 04, 08, March 2006, 18)
(i) Contention (ii) Token passing
Explain in brief Token passing and Polling' access. Methods.

(March 10; July 17, 18, Oct. 2021)

Ans. :

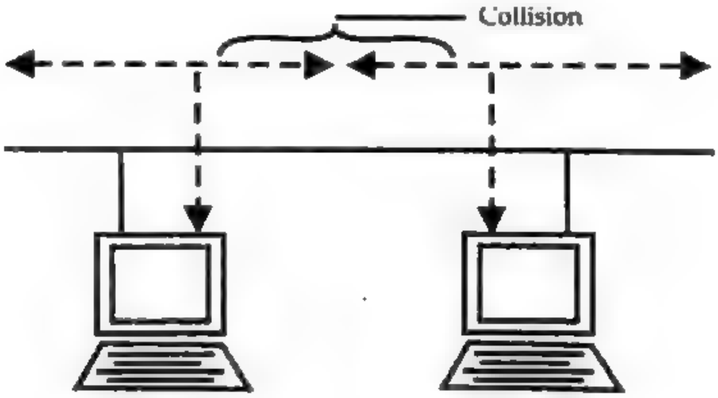
(1) An access method is a set of rules governing how the network nodes share the transmission medium.

(2) There are three most important types of media access methods :
(A) Contention (B) Polling (c) Token passing

(3) **Contention :**

a) In contention, any computer in the network can transmit at any time (first come first served).
b) This system breaks down when two computeres attempt to transmit at the same time. This is a case of collision.
c) To avoid collision, carrier sensing mechanism is used. Here each computer listens to the network before attempting to transmit. If network is busy, it waits until network quiets down.
d) In carrier detection, computers continue to listen to the network as they transmit. If computer detects another signal that interferes with the signal it is sending, it stops transmitting. Both computers then wait random amount of time and attempt to transmit.

e) Contension methods are most popular media access control method on LANs.



(4) Polling :

a) In polling based systems, there is a device (called controller or master device) to poll other devices on the network to see whether they are ready to either transmit or receive data.

b) This access method is not widely used on network because the polling itself can cause a fair amount of network traffic.

(5) Token passing :

a) Token passing utilizes a frame called a token, which circulates around the network.

b) A computer that needs to transmit must wait until it receives the token.

c) When computer receives token, it is permitted to transmit.

d) When computer completes transmitting, it is passes the token frame to the next station or token ring network.

Q. 35 Explain the following terms with respect to cabling :

(A) 10 BASE 2 (B) 10 BASE 5

(C) 10 BASE T (D) 10 BASE FL

Ans. :

(A) 10 BASE 2 :

(i) This uses thinnet of co-axial cables.

(ii) Each network connects directly to the network cable with a T-connector.

(iii) The minimum cable distance between clients must be 1.5 feet.

(iv) The T connector must be connected directly to the network adapter.

(v) The entire network cabeling scheme cannot exceed 925 meters (3035 feet).

(B) 10 BASE 5 : This uses thicke net co - axial cable.

(i) 10 BASE 5 uses an external transreceiver to attach to the network adapter card.

(ii) The minimum cable distance between transceivers is 2.5 metres.

(iii) The maximum network segment length is 500 meter (1640 feet)

(iv) The entire network cabling scheme cannot exceed 2500 meters. (8200 feet)

(C) 10 BASE T :

(i) This uses UTP cable.

(ii) The maximum number of computers on a LAN is 1024.

(iii) The cabling should be UTP category 3, 4 and 5. STP cable can also be used.

(iv) The cable segment length (hub to transceiver) is 100 meters (328 feet)

(D) 10 BASE FL :

(i) 10 BASE FL is a specification for ethernet over fiber optic cables.

(ii) This supports a maximum cabeling distance of about 2000 meters and eliminate any electrical complications.

Protocols

Q. 36 What is meant by protocol ? Explain the concept of TCP/IP protocol.

(March 2004, 08, 18, 11, Oct. 2003, 04; June 2016; July 2019)

OR Define 'Protocol'. Explain TCP/IP protocol. (Dec. 2020)

OR What is protocol? Explain TCP/IP protocol in detail? (Oct. 2021)

Ans. :

(1) A protocol is defined as an agreement between communication particle for how communication should be proceed.

OR protocols are rules by which computers communicates i.e. protocol is set of rules and formats for sending and receiving data.

(2) Internet protocols are called TCP/IP (Transmission Control Protocol/Internet Protocol) protocols. This protocol do not belong any one company and technology is available to everybody.

(3) TCP/IP protocol use three types of addresses for network addressing :

(a) Hardware or physical address is used by the data link and physical layers.

(b) Internet protocol address provides logical node identification. This address is unique address assigned by administrator expressed in four parts dotted notation. e.g. 123.144.131.21

(c) Logical node names are easier to remember than an IP address.

Introduction to connectivity devices

Q. 37 Explain modem in detail. (March 2006, 10, 17, 22; Oct 2010; Dec. 2020)

Ans. :

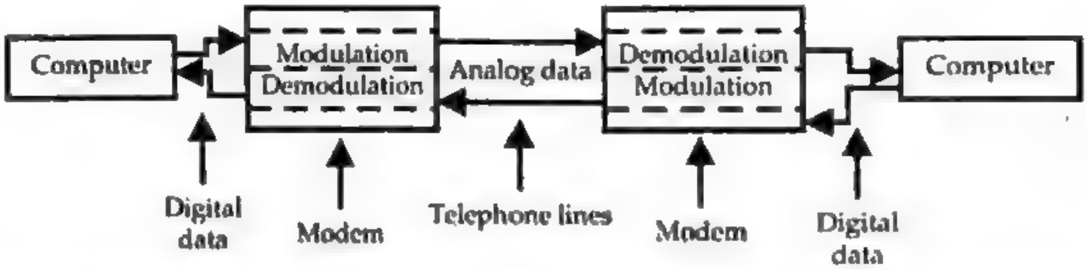
(1) Computers store digital data, while telephone lines can only transfer analog data. If a computer is to be connected to internet through telephone, then it must convert digital data to analog data before transmitting the computer signals.

(2) Converting one signal form to another form is called modulation and reconverting it to original form is called as demodulation.

(3) Modem is modulator/demodulator. Modem is used to connect computer to internet. Modems convert digital data to analog data and vice-a-versa.

(4) They have two advantages :
   (i) Modem allows higher speed of transmission on any given analog line.
   (ii) Modem reduce effect of noise and distortion.

(5) The function of modem is described by following figure.



(6) Modems are classified into two categories according to transmission method :
   1. Asynchronous modems
   2. Synchronous modems

Q. 38 What are the two types of modems. Explain them. **(March 2010, 22, Dec. 2020)**

Ans. : Modems are classified into two categories depending upon transmission methods:
   1) Asynchronous modems
   2) Synchronous modems

1) Asynchronous modems :

(a) In asynchronous modems, transmission clock is not used for synchronisation. Instead it uses, bit synchronisation.

(b) Here each frame begins with a start bit that enables the receiving device to adjust to the timing of transmitted signal.

(c) Messages are kept short.

(d) It is used to transmit character data.

(e) Asynchronous transmission is simple, inexpensive technology. It is used for PC to PC communication.

2) Synchronous modems :

(a) Synchronous modes uses clocks on transmitting and receiving devices.

(b) It uses a 'sync' signal, which is a bit pattern and can be easily recognised by the receiver.

(c) A wide variety of data types can be transmitted.

(d) A long series of bits can also be transmitted.

Q. 39 Explain Hubs and repeaters in details. **(March 02, 05, 09, 10, 18,Oct. 06; July 19)**

OR

What is Hub ? Explain active and passive hab. **(March 2004, 2010, 2020)**

Ans. :

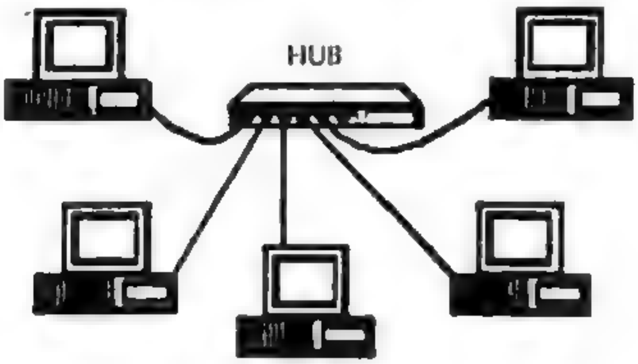
I) Hubs :

(1) In some network topologies, mostly ARCNET based star topologies, a device hub is used.

(2) Hub is a connecting device in which cables can be connected without soldering wires to centralise network traffic through a single connecting point.

(3) It manages the cabling in the network and sends signal to the other components of the network.

Figure shows a network inter-connected with hub.



(4) Hubs are of three types :

(i) Active hub (ii) Passive hub (iii) Switching hub

(5) The active hub interconnect the network and also amplifies the signal received apart from splitting and retransmitting it to the destination. This hub contains electronic circuits.

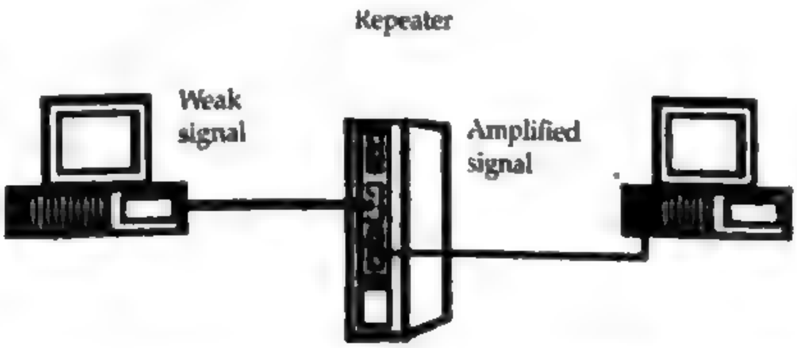
(6) Passive hub only splits and transmits signal received and it can not amplify it. This do not contain any electronic component.

(7) Switching hub are quickly routes the signals between ports of hubs. It can be used in place of router.

II) **Repeater :** (Oct. 2010, March 2018, 19, 22)

(1) A repeater is a hardware unit mostly used in Ethernet to extend.

(2) A repeater reshapes and amplifies the signal from one Ethernet segment to another. Figure shows network with repeaters :



(3) A backbone cable runs vertical up in the building and a repeater is used to attach an Ethernet segment running in each floor of the office to the backbone cable.

(4) No two Ethernet workstations can have more than two repeaters between them, if they have to communicate reliably.

(5) The main disadvantage of repeaters is that they repeat noise in the system.

(6) Separate power supply is needed for repeaters.

Q. 40 Write a short note on routers. OR **(March 2006, 18, 19)**
Explain function of Router in Network and list different types of Routers.
(Oct. 2009, March 2022)

OR What is ROUTER? Explain its type in detail? **(Oct. 2021)**

Ans. :

(1) Routers are internetwork connectivity devices. They are used to connect two topologically similar or dissimilar LANs. i.e. the LANs can be different e.g. they can be ethernet and token ring. Each LAN is logically separate and is assigned an address.

(2) Routers can use network address to assist efficient delivery of message. Delivering packets according to logical network address is called as routing. Routers performs routing.

(3) Routers are intelligent. They can use algorithms to determine most efficient path for sending a packet to any given network.

(4) Routers can also be used to divide large, busy LANs into smaller segments.

(5) Routers are also employed to connect LAN to wide area network (WAN).

(6) Routers are of two types :
1. Static routers 2. Dynamic routers
Static routers do not determine paths, but you need to specify them. Dynamic routers have capacity to determine paths (routes).

Q. 41 Write the functions of each of the following devices in short :
(March 2008, 2011 Oct. 2003, 2004, 2005, 2007, 2009)

(i) Modem (ii) Hub (iii) Repeater (iv) Routers

Ans. : (i) Modem :

(a) Modem means modulator / demodulator.
(b) It is used to connect computer to internet.
(c) Modem convert digital data to analog data and vice-a-versa.

(ii) Hub :

(a) Hub is a connecting device in which cables can be connected to centralize network traffic through a single connecting point.
(b) It manages the cabling in the network and sends signal to the other components of the network.

(iii) Repeater :

(a) A repeater reshapes and amplifies the signal from one network to another.

(iv) Routers :

(a) Routers are internetwork connectivity devices used to connect two topologically similar or dissimilar LANs.
(b) Routers use algorithm to determine most efficient path for sending a packet to any given network.

Q. 42 Explain the following terms **(March 2003)**
(a) Modem (b) Hub (c) Repeater

Ans. : Please refer Q. 36.

Q. 43 Give atleast two advantages and one disadvantage of wireless media over cable media. **(March 2014)**

Ans. : Advantages of wireless media :

(1) Communication can reach rural and hilly area.

(2) High data rate transmission by using large bandwidth.

Disadvantages of wireless media :

(1) Skilled labour require to install. This increases cost of network.

(2) EMI and outside noise disturb the signal.

Q. 44 Explain TCP/IP protocol in detail. (March 2019)

Ans. :

A protocol is defined as an agreement between communication particle for how communication should be proceed.

OR protocols are rules by which computers communicates i.e. protocol is set of rules and formats for sending and receiving data.

General TCP/IP Transport Protocols

In transport protocols there are two main forms of address : a node address and a logical network address.

A node address is the address of the entity of device on the network. Logical network address is the segment on the network to which node is attached.

TCP/IP uses numbering scheme. This number is IP address. All devices on network need a unique IP address. An IP address is a set of four numbers, they can range in value between 0 to 255. Each number is separated by period.

For example : 34.120.66.79 or 107.219.2.34

There are three classes of address – class A, class B and class C. In class A, the number between 1 and 127 appears before first dot. The first number represent the network address. The last three numbers represent the node or host number. In 34.120.66.79, the host number is 120.66.79 on network 34. In class B, the first number can range in value from 128 to 191. The first two numbers forms network address and last two forms host ID.

In class C, the first number can range in from 192 to 223. The first three numbers make up the network address and last number forms host ID.

Internet Protocol (IP)

IP is connectionless protocol. It is packet – switching protocol that performs addressing and route selection. IP routes packets through internet works. It also performs disassembly and reassembly. IP also performs error checking.

Q. 45 Select the correct alternative and rewrite the following.

1. —— cable type is ideal for connecting between two buildings.
   (i) UTP (ii) STP (iii) Co-axial (iv) Fibre optic

Ans. : (iv) Fibre optic

2. In —— topology connections are made from centre point of server or Hub.
   (i) Bus (ii) STAR (iii) RING (iv) All of these

Ans. : (ii) STAR

3. The process of modulation and demodulation is done by device namely ———.
   (i) Hub (ii) Repeater (iii) Router (iv) Modem

Ans. : (iv) Modem

4. If the network is to be extended beyond predefined cable limit —— is used. (March 2002)
   (i) Modem (ii) Repeater (iii) Hub (iv) Router

Ans. : (ii) Repeater

5. All the systems on a network must follow a set of common rules, called as ——
(i) Protocol (ii) Interface (iii) Convensions (iv) None of these.

Ans. : (i) Protocol

6. —— cable has highest sensitivity to EMI.
(i) STP (ii) UTP (iii) Fibre optic (iv) Co-axial

Ans. : (ii) UTP

7. BUS topologies are suited for networks that uses —— access methods.
(i) contension based (ii) token passing (iii) polling (iv) None of these

Ans. : (i) Contension based

8. Token ring network was originally developed by ——
(i) AT & T Bell laboratories
(ii) IBM
(iii) Polo Alu Research Centre (PARC)
(iv) Xerox corporation

Ans. : (ii) IBM

9. The transmission rate for fibre optic cable is typically —— **(Oct. 2003, March 2005)**
(i) 10 MBPS (ii) 25 MBPS (iii) 100 MBPS (iv) 500 MBPS

Ans. : (iii) 100 MBPS

10. The conversion from digital to analog and vice-versa is done by —— **(Oct. 2002)**
(i) repeater (ii) Hub (iii) Modem (iv) Router

Ans. : (iii) Modem

11. A device used for modulation and demodulation process in network is —— **(March 2004)**
(a) Hub (b) Router (c) Modem (d) Repeater

Ans. : (c) Modem

12. —— cable type is ideal for connection of networks which are at a 10 km distance. **(Oct. 2004)**
(i) UTP (ii) STP (iii) Co-axial (iv) Fibre optic

ns. : (iii) Co-axial

1. The cellphone or mobile phone uses —— transmission technology. **(Oct. 2005)**
(i) Radio (ii) Microwave (iii) Infrared (iv) Satelite

Ans. : (ii) Microwave

14. —— does not regenerate the computer signal in networks. **(March 2006)**
(i) Passive Hub (ii) Active Hub (iii) Repeater (iv) All the three

Ans. : (i) Passive Hub

15. —— cable type support the greatest cable length for computer networking. **(Oct. 2006)**
(i) UTP (ii) STP
(iii) Thicknet co-axial (iv) Thinnet Co-axial

Ans. : (iii) Thicknet co-axial

16. The transmission rate of ______ is typical for fibre optic cables. **(Oct. 2003)**
(i) 10 Mbps (ii) 25 Mbps (iii) 100 Mbps (iv) 500 Mbps

Ans. : (iii) 100 Mbps

17. A device used for modulation and demodulation process in network is ______ (March 2004)

(a) Hub (b) Router (c) Modem (d) Repeater

Ans. : (c) Modem

18. ______ cable type is ideal for connection of networks which are at a 10 km distance. (Oct. 2004)

(i) UTP (ii) STP (iii) Co-axial (iv) Fiber optic

Ans. : (iii) Co-axial

19. The transmission rate of ______ is typical for the fibre optic cable. (March 2005)

(i) 10 mbps (ii) 25 mbps (iii) 100 mbps (iv) 500 mbps

Ans. : (iii) 100 mbps

20. The cellphone or mobile phone uses ____ transmission technology. (Oct. 2005)

(i) Radio (ii) Microwave (iii) Infrared (iv) Satellite

Ans. : (ii) Microwave

21. _____ does not regenerate the computer signal in networks. (March 2006)

(i) Passive Hub (ii) Active Hub (iii) Repeater (iv) All the three

Ans. : (i) Passive Hub

22. _____ cable type support the greatest cable length for computer networking. (Oct. 2006)

(i) UTP (ii) STP (iii) Thicknet Co-axial (iv) Thinnet Co-axial

Ans. : (iii) Thicknet Co-axial

23. cable has highest bandwidth. (March 2007)

(i) UTP (ii) STP (iii) Co-axial (iv) Fiber Optic

Ans : (iv) Fiber Optic

24. The Transmission Rate of _________ is typical for fiber optic cables. (Oct. 2007)

i) 10 Mbps ii) 25 Mbps iii) 100 Mbps iv) 5000 Mbps

Ans : (iii) 100 Mbps

25. Most widely used and economical cable for network installation is ———. (March 2008)

(i) Fiber-Optic (ii) UTP (iii) STP (iv) Co–axial

Ans : **Co-axial**

26. If the network is to be executed beyond predefined cable limit, ________ is used. (Oct. 2008)

(i) Modem (ii) Repeater
(iii) Hub (iv) Router

Ans. : (ii) Repeater

27. Electromagnetic Interference is minimum in case of _________ cable. (March 2009)

(i) UTP (ii) STP (iii) Fiber Optic (iv) Co-axial

Ans. (iii) Fiber Optic

28. In TCP/IP is _______ protocol. **(Oct. 2009)**
(i) Connectionless (ii) Connection Oriented
(iii) Address Resolution (iv) Datagram

Ans. : (i) Connectionless

29. _______ Cable is most sensitive to EMI. **(March 2010)**
(i) STP (ii) UTP (iii) Co-axial (iv) Fiber Optic

Ans. : (ii) UTP

30. _____ is the type of cable, which does not carry electrical signals. **(Oct. 2010)**
(i) UTP (ii) Co-axial (iii) STP (iv) Fiber Optic

Ans : (iv) Fiber Optic

31. Bus Topologies are best suited for networks that use ________ Access Methods. **(March 2011)**
(i) Contention Based (ii) Token Passing
(iii) Polling (iv) None of these

Ans : (i) Contention Based

32. ________ Cable uses light signals to transmit the data. **(Oct. 2011)**
(i) Co-axial (ii) Fiber Optic
(iii) STP (iv) UTP

Ans.: (ii) Fiber Optic

33. The Installation Cost of _______ cable is maximum. **(March 2012)**
(i) STP (ii) UTP
(iii) Fiber Optic (iv) Co-axial

Ans.: (iii) Fiber Optic

34. A ______ is a set of rules governing the Share of Transmission Medium network. **(Oct. 2012)**
(i) Frames (ii) Protocol
(iii) Assess Method (iv) Topology

Ans. : (ii) Protocol

35. _______ cable type is ideal for connecting between two buildings. **(March 2013)**
(i) UTP (ii) STP (iii) Co-axial (iv) Flat

Ans. : (iii) Co-axial

36. _________ is a set of rules and formats for sending and receiving data in a network. **(Oct. 2013)**
(i) Interface (ii) Frames (iii) Protocols (iv) Access Method

Ans. : (iii) Protocols

37. _________ cable has maximum EMI resistance. **(March 2014)**
(i) Thicknet (ii) Thinnet (iii) UTP (iv) Fiber optic

Ans. : (iv) Fiber optic

38. _________ cable is most costly among all. **(Oct. 2014)**
(i) UTP (ii) STP (iii) Fiber Optic (iv) Co-axial

Ans. : (iii) Fiber Optic

39. The device used is extend cable length of a network is ________. **(March 2015)**

(i) MODEM (ii) REPEATER
(iii) HUB (iv) ROUTER

Ans. : (ii) REPEATER

40. In _______ Topology, all devices are connected to a central hub. **(Oct. 2015)**

(i) Ring (ii) Star (iii) Bus (iv) None of the above

Ans. : (ii) Star

41. If length of cable is very long then ______ is used in between to bring the weakend signal to its original level. **(March 2016)**

(i) MODEM (ii) HUB (iii) REPEATER (iv) ROUTER

Ans. : (iii) REPEATER

42. Thinnet cable can reliably transmit a signal upto _____ meter without connectivity devices. **(July 2016)**

(i) 500 (ii) 185 (iii) 1000 (iv) 10,000

Ans. : (ii) 185

43. ______ cable uses light signals to transmit data. **(March 2017)**

(i) Fiber Optic (ii) Coaxial
(iii) UTP (iv) STP

Ans. : (i) Fiber Optic

44. _________ of the following is an example of wireless media. **(March 2019)**

(i) Optic Fibre (ii) Microwave
(iii) UTP (iv) STP

Ans. : (ii) Microwave

45. The mobile phone uses _______ transmission technology. **(July 2019)**

(i) Radio (ii) Microwave
(iii) Infrared (iv) Satellite

Ans. : (ii) Microwave

46. _______ cable is insensitive of EMI. **(March 2020)**

(i) Co-axial (ii) STP
(iii) UTP (iv) Fiber Optic

Ans. : (iv) Fiber Optic

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Oct. 2003

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	04	12	02	08	–	–	21
2	Instruction Set and Programming of 8085	01	01	04	12	–	–	06	30	43
3	Introduction to INTEL X-86 Family	–	–	–	–	01	04	–	–	04
4	Introduction of Microcontroller	01	01	01	03	01	04	–	–	08
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	01	01	12	36	06	24	06	30	94

Q. 1 A) Select the correct alternatives and rewrite the following :

a) In the flag register of 8085 microprocessor _______ number of bits are kept unused. **(1)**

(i) 5 (ii) 3 (iii) 4 (iv) 2

The 8051 microcontroller has an ALU of _______ bit capacity. **(1)**

(i) 8 (ii) 16 (iii) 32 (iv) 64

c) The transmission rate of ______ is typical for fibre optic cables. **(1)**

(i) 10 Mbps (ii) 25 Mbps (iii) 100 Mbps (iv) 500 Mbps

d) The instruction MOV B, A of 8085 microprocessor is an example of _____ addressing mode. **(1)**

(i) Direct (ii) Implicit (iii) Register indirect (iv) Register

Ans : a) 3 b) 8 c) 100Mbps d) - Register

B) Answer any two of the following :

a) Draw neat labelled block diagram of a generic microprocessor. **(Ch.1/Q. 5)** **(3)**

b) Explain register indirect and immediate addressing modes in case of 8085 microprocessor with the help of suitable examples. **(Ch.2/Q. 3)** **(3)**

c) Mention any six important features of microcontroller 8051. **(Ch. 4/Q. 3)** **(3)**

Q. 2 A) Answer any two of the following :

a) Write a short note on evolution of microprocessors. Give one examples of each generation. **(Ch. 1 /Q. 2)** **(3)**

b) Explain the following instructions of 8085 microprocessor : **(Ch.2/Appendix)** **(3)**

(i) CMC - **((18) Group/III)** (ii) RAL - **((15) Gr.VII)**

(iii) XRA M - **((8) Gr. III)**

c) Compare the Coaxial cable with Twisted Pair cable. Mention atleast three points. **(Ch. 5 /Q. 17)** **(3)**

B) Answer any one of the following :

a) Write the function of following units in the microprocessor 8085 : **(Ch.-1)** **(4)**

(i) Accumulator - **(Q. -34)** (ii) Stack pointer - **(Q.35)**

(iii) Instruction decoder - **(Q. 35)** (iv) Serial I/O control - **(Q. 34)**

b) List the advanced microprocessors of INTEL X-86 family and mention three attributes of anyone of them. **(Ch.3/ Q.7)** **(4)**

Q. 3 A) Answer any two of the following :

a) List any three primary functions of the CPU of microcomputer. **(Ch. 1/Q. 4)** **(3)**

b) Describe in brief the function of following pins in 8085 microprocessor : **(3)**

(i) HLDA (ii) READY (iii) RST 7.5 **(Ch. 1 / Q. 11)**

c) Explain the ring topology and token passing. **(Ch.5/Q.33)** **(3)**

B) Answer any one of the following :

a) Write a short note on flag register of 8085 microprocessor. Explain the significance of flag bits with one example. **(Ch. 1/ Q. 39)** **(4)**

b) Explain in detail how 8051 microcontroller addresses two separate memory spaces. **(Ch. 4/Q.-5)** **(4)**

Q. 4 A) Answer any two of the following :

a) The Accumulator of 8085 contains data 43 H. What will be it's contents after the execution of following instructions independently ? **(Ch.2 / Q. 18)** **(3)**

(i) CMA (ii) ANI 09H (iii) INR A

b) Explain the following instructions with suitable example : **(Ch. 2/Appendix)** **(3)**

(i) DAA - **(Group II (20))** (ii) LHLD - **(Group I (9))**

c) What is meant by protocol ? Explain the concept of TCP / IP protocol. **(Ch.5/Q. -36)** **(3)**

B) Answer any one of the following :

a) State four LAN wireless transmission methods. Explain any two of them. **(Ch/ 5/ Q. 21)** **(3)**

b) Write the functions of each of the following devices in short : **(4)**

(i) Modem (ii) Hub (iii) Repeater (iv) Routers

(Ch. 5 /Q - 41)

Q. 5 A) Answer any two of the following :

a) Write an assembly language program to copy a block of data having starting address 8900 H to the new location starting from 9100H. The length of block is stored at memory location 88FFH. **(5)**

Ans. : (Pl. refer. ch. 2/ Q. 19)

b) Write an assembly language program to add two 8 bit BCD numbers stored at memory location 5000H and 5001H. Store the result at memory location 5002 H onwards starting with least significant bit. **Ans. : (Pl. refer. ch. 2/ Q. 20)** **(5)**

c) Write an assembly language program to find out 2's compliment of five numbers stored from memory location 3330H and onwards. Store the result from memory location address 4100H.

Ans. : (Pl. refer. ch. 2/ Q. 21)

Q. 5 Answer any two of the following :

a) A block of data is stored in memory location from 9101H to 91FFH. Write an assembly language program to transfer the block in reverse order to memory location 9200H and onwards. **(5)**

Ans. : (Pl. refer. ch. 2/ Q. 22)

b) Write an assembly language program to count the number of odd data bytes occuring in a block starting from the memory location address 7501H to 756FFH Store the result at the memory location 7600H. **(5)**

Ans. : (Pl. refer. ch. 2/ Q. 23)

c) Write an assembly language program to perform the multiplication of two 8-bit numbers where multiplicand is stored at the memory locations 2501H and 2502H and multiplier is stored at 2503H. The result is to be stored at memory location address 2504H and 2505H. (Note : 8 bit multiplicand is extended to 16 bit) **(5)**

ns. : (Pl. refer. ch. 2/ Q. 24)

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March 2004

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	04	12	02	08	–	–	21
2	Instruction Set and Programming of 8085	01	01	04	12	–	–	06	30	43
3	Introduction to INTEL X-86 Family	–	–	–	–	01	04	–	–	04
4	Introduction of Microcontroller	01	01	01	03	01	04	–	–	08
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1 (A) Select the correct alternative and rewrite the following : **(4)**

(1) In 8085 microprocessor, serial data from external device is received on ____ pin.

(a) SID (b) SOD (c) HOLD (d) READY

(2) In 8085 microprocessor, flag register is not affected after the execution of _____ instruction.

(a) INR r (b) DCR r (c) ADD r (d) INX rp

(3) _______ is not a characteristic feature of 8051 microcontroller.

(a) 4 kbyte of internal RAM (b) 4 kbyte of internal ROM

(c) 4 parallel bidirectional I/O port (d) Full featured serial port.

(4) A device used for modulation and demodulation process in network is ______

(a) Hub (b) Router (c) Modem (d) Repeater

Ans. : (1) SID (2) INX rp (3) 4 kbyte of internal RAM (4) Modem

(B) Answer any two of the following :

(a) Explain the organization of ALU with simple block diagram. **(Ch. 1/Q. 31)** **(3)**

(b) Explain the register and direct addressing modes of 8085 microprocessor with an example of each.**(Ch. 2/Q. 2)** **(3)**

(c) List any six major features of 8051 micro-controller. **(Ch. 4/ Q.3)** **(3)**

Q. 2 **(A) Answer any two of the following :**

(1) Explain the function of the following registers of 8085 microprocessor. **(3)**

(2) Explain the following instructions of 8085 microprocessor with suitable example of each. **(3)**

(3) Explain in short the six important characteristics of transmission media. **(Ch. 5/ Q. 4)** **(3)**

(B) **Answer any one of the following :**

(1) Explain in brief the four primary functions of the CPU of a microcomputer. **(Ch. 1/Q. 4)** **(4)**

(2) Compare any four attributes of 80286 and pentium microprocessor. **(Ch. 3/Q. 9)** **(4)**

Q. 3 **(A) Answer any two of the following :**

(1) Explain the sign and parity flags of 8085 microprocessor with suitable example. **(Ch. 1/ Q.39)** **(3)**

(2) Describe in brief the function of the following pins of 8085 microprocessor : **(Ch.1)**

(a) RESET OUT - **(Q. - 16(a))** (b) HLDA - **(Q. 11 (4))**

(c) IO/ $\overline{\text{M}}$- **(Q. 15/(a))**

(3) What do you mean by network topology ? Explain in brief the two basic categories of topology. **(Ch. 5/Q.-22)** **(3)**

(B) **Answer any one of the following :**

(1) In 8085 microprocessor, the flag register content is 3CH. Interpret its meaning. **(Ch.1/Q.45)** **(4)**

(2) What is a Microcontroller ? State three expanded features of 8052 over 8051 microcontroller. **(Ch. 4/ Q. 9)** **(4)**

Q. 4 **(A) Answer any two of the following ;**

(1) The accumulator of 8085 microprocessor contains the data 45 H and register E contains the data 7BH. What will be the content of accumulator after execution of each of following instructions independently ?

i) XRA E ii) ADI C5H iii) DORI 5 BH **(Ch.2/Q. 19)** **(3)**

(2) Explain the following instructions of 8085 microprocessor with suitable example of each : **(3)**

(3) What is Hub ? Explain the active and passive Hubs. **(Ch-5/Q. 39)** **(3)**

(B) **Answer any one of the following :**

(1) Compare any four attributes of UTP and Optical Fibre Cable. **(ch.5/Q. 15)** **(4)**

(2) What do you mean by 'Protocol' ? Write a short note aTCP/IP protocol. **(ch.5/Q. 36)** **(4)**

Q. 5 Answer any two of the following :

(1) Write an assembly language program to divide a hexadecimal number stored in a memory location 8000 H by a hexadecimal number stored in memory location 8001 H. Store the quotient at 8002 H and remainder at 8003 H. **(5)**

Ans. : (Pl. refer. ch.2/ Q. 25)

(2) An 8-bit number is stored in memory location C400H. Write an assembly language program to count the 'zero' in the given number. Store the count in memory location C500H. **(5)**

Ans. : (Pl. refer. ch.2/ Q. 26)

(3) Write an assembly language program to transfer first 10 bytes of memory block starting from 5000 H to a new block starting from 5020 H. **(5)**

Ans. : (Pl. refer. ch.2/ Q. 27)

OR

Q. 5 Answer any two of the following :

(1) Write an assembly language program to generate the Fibbonacci's series for first eight numbers. Store the series in a memory block starting from C100H.
(Note : The first hexa-numbers of series are 00, 01, 01, 02, 03, 05, 08, 0D) **(5)**

Ans. : (Pl. refer. ch.2/ Q. 28)

(2) The two BCD numbers are stored at 3400H and 3401H. Write an assembly language program to add these BCD numbers and store the result in memory locations 3402 H and 3403 H. **(5)**

Ans. : (Pl. refer. ch.2/ Q. 29)

(3) Write a assembly language program to count the occurrence of the data 9CH in a memory block starting from 4000H to 400FH. Store the count at memory location 4500H.

Ans. : (Pl. refer. ch.2/ Q. 30)

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Oct. 2004

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	02	02	04	12	01	04	–	–	18
2	Instruction Set and Programming of 8085	01	01	01	03	01	04	06	30	38
3	Introduction to INTEL X-86 Family	–	–	01	03	01	04	–	–	07
4	Introduction of Microcontroller	–	–	01	03	01	04	–	–	07
5	Networking Technology	01	01	05	15	02	08	–	–	24
	Total	04	04	12	36	06	24	06	30	94

Q. 1 **(A) Select the correct alternative and rewrite :** **(4)**

(a) _______ is not a vectored interrupt.

(i) Trap (ii) INTR (iii) RST 7.5 (iv) RST 6.5

(b) ______ cable type is ideal for connection of networks which are at a 10 km distance.

(i) UTP (ii) STP (iii) Co-axial (iv) Fiber optic

(c) Usually operating frequency of 8085 is ______

(i) 3 MHz (ii) 100 MHz (iii) 1 MHz (iv) 20 MHz

(d) ______ of following instruction belongs to register indirect addressing mode.

(i) LXI H, 1050 (ii) MVI A, 05 (iii) CMP B (iv) MOV C, M

Ans. : a) INTR b) Co-axial c) 3 MHz d) MOV C, M

(B) **Attempt any two of the following :** **(6)**

(a) Write a note on evolution of Micro-processors ? **(ch.1/Q. 2)**

(b) What is a Transmission Medium ? What are the advantages of wireless transmission ? **(ch. 5/Q. 3)**

Q. 2 **(A) Attempt any two of the following :** **(6)**

(a) Draw a neat labelled pin diagram of 8085. **(ch. 1/Q. 8)**

(b) Explain in brief the features of Pentium Processor. **(ch.3/Q. 3(V))**

(c) Write a note on Twisted Pair Cable. **(ch.5/Q. 10)**

(B) Attempt any one of the following :

(a) Explain in brief the following connectivity devices : **(ch.5/Q. 41)** **(4)**

(i) Modem (ii) HUB (iii) Repeater (iv) Router

(b) Explain the following instructions using examples : **(ch.2/Appendix)** **(4)**

(i) LHLD **(Gr. I(9))** (ii) DAD **(Gr. II(19))**

(iii) XCHG **(Gr. I(13))** (iv) CMP **(Gr.III(10))**

Q. 3 (A) Attempt any two of the following :

(a) State different features of 8051 microcontroller. **(ch4/ Q. 3)**

(b) Explain the following terms : **(ch.1/Q -55)**

(i) T - state (ii) Machine cycle (iii) Instruction cycle

(c) What are the contention and polling access methods. **(ch.5/Q. 34)**

(B) Attempt any one of the following : **(4)**

(a) What is a Vectored Interrupt ? What is a Non-maskable Interrupt ? State all hardware interrupts with their priorities and branching addresses. **(ch.1/Q. 28)**

(b) Explain in brief different members of X-86 family. **(ch.3/Q. 3)**

Q. 4 (A) Attempt any two of the following : **(6)**

(a) What is Protocol ? Explain the concept of TCP protocol ? **(ch.5/Q. 36)**

(b) Explain the following :

i) Instruction Register ii) Program counter iii) Accumulator

Ans : i) Ch-1/Q. 35(c), ii) Ch-1/Q. 35(d), iii) Ch-1/Q. 34(I)

(c) Write a short note on LAN. **(ch.5/Q. 7)**

(B) Attempt any one of the following : **(4)**

(a) What is a Microcontroller ? Discuss the different members of 8051 micro controller family. **(ch\4/Q. 1& Q. 7)**

(b) What are Network Topologies ? Explain the commonly used topologies with appropriate diagrams. **(ch.5/Q. 26)**

Q. 5 Attempt any two of the following :

(a) Two three - byte numbers are stored in BCD and EHL registers. Write an assembly language program to find their sum and store the result in EHL.

Ans. : (Pl. refer /ch.2/ Q. 31).

(b) Write an assembly language program to divide data at location 1050 by data stored at location 1051. Store the quotient and remainder in 1060 and 1061 memory locations respectively.

Ans. : (Please See similar Question 25 and make necessary changes)

(c) The length of block is in memory location 1070 and block itself begins from 1071. Write a program in assembly language to store the count of odd numbers in register C.

Ans. : (Pl. refer /ch.2/ Q. 33). **OR**

Q. 5 Answer any two of the following :

(a) Write a program in assembly language to transfer a block of data from 1050 to 1059 to memory location whose starting address is 1070 using exchange (XCHG) instruction. (10)

Ans. : (Pl. refer /ch.2/ Q. 34).

(b) Write a program in assembly language to find the two's compliment of a sixteen bit number stored in memory location C000 and C001. Store the result in memory locations C002 and C003.

Ans. : (Pl. refer /ch.2/ Q. 35).

(c) Write an assembly language program to check validity of given code at location C020. A code is said to be valid, if count of high (logic 1) in first five MSB's reads two and remaining three bits read low. If code is valid, HL should read AAAA or else it should read FFFF.

Ans. : (Pl. refer /ch.2/ Q. 36).

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March 2005

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	04	12	02	08	–	–	21
2	Instruction Set and Programming of 8085	01	01	04	12	–	–	06	30	43
3	Introduction to INTEL X-86 Family	–	–	–	–	01	04	–	–	04
4	Introduction of Microcontroller	01	01	01	03	01	04	–	–	08
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1 (A) Select the correct alternative and rewrite the following : **(4)**

(a) 8051 micro-controller has instruction set of ______

(i) 99 (ii) 111 (iii) 120 (iv) 110

(b) The full form of instruction DAA is ______

(i) Double Add Accumulator (ii) Decimal Add Accumulator

(iii) Double Adjust Accumulator (iv) Decimal Adjust Accumulator

(c) The invalid register pair for 8085 micro-processor is ______

(i) BC (ii) HL (iii) SP (iv) DE

(d) The transmission rate of ______ is typical for the fibre optic cable.

(i) 10 mbps (ii) 25 mbps (iii) 100 mbps (iv) 500 mbps

Ans.:	a) 111	b) Decimal Adjust Accumulator	c) SP	d) 100 mbps

(B) Answer any two of the following:

(a) Draw a neat labelled diagram of a generic micro-processor. **(ch1/Q. 5)** **(3)**

(b) What are the different addressing modes used in 8085 micro-processor? Explain any two of them with a suitable example. **(ch.2/Q. 2)** **(3)**

(c) Define the term "Micro-controller". State any four advantages of the same over micro-processor based system. **(ch.4/Q. 2)** **(3)**

Q. 2 (A) Answer any two of the following:

(a) Explain the following instruction of 8085 micro-processor.(ch.2/Appendix)

(i) CMC **(Gr. III(18))** (ii) RAR **(Gr. III(16))**

(iii) XRA M **(Gr. III (8))** **(3)**

(b) Compare the Co-axial cable and Twisted Pair cable used for networking. Mention at least three points. **(ch.5/Q. 17)** **(3)**

(c) Write a short note on evolution of micro-processors giving an example of each generation. **(ch.1/Q. 2)** **(3)**

(B) Answer any one of the following:

(a) Write the function of following units in 8085 micro-processor. **(ch.1)** **(4)**

(i) Accumulator **(Q. 34(1))** (ii) Stack pointer **(Q. 35(b))**

(iii) Instruction decoder **(Q. 35(c))** (iv) Serial I/O controller **(Q. 34 (v))**

(b) Explain with neat diagram the programming model of 16-bit version of X86 family of processor. **(ch.3/Q. 13)** **(4)**

Q. 3 (A) Answer any two of the following:

(a) Describe in brief the function of following pins of 8085 micro-processor. **(ch.1)**

(i) TRAP **(Q. 15(b))** (ii) WR **(Q. 9(3))** (iii) ALE **(Q. 9(1))** **(3)**

(b) Define the following terms with suitable diagram. **(3)**

(i) Instruction cycle (ii) Machine cycle (iii)T-states **(ch.1/Q. 55)**

(B) Answer any one of the following:

(a) The flag register of 8085 micro-processor contains the data B5 H. Interpret its meaning. **(ch.1/Q. 48)** **(4)**

(b) Explain in detail how 8051 micro-controller addresses two separate memory spaces. **(ch.4/Q. 5)** **(4)**

Q. 4 **(A) Answer any two of the following :**

(a) Accumulator of 8085 contains data 56 H. What will be the contents after the execution of following instructions independently. **(ch.2/Q. 20)**

(i) CMA (ii) ANI ACH (iii) INR A **(3)**

(b) Explain the execution of following instructions of 8085 micro-processor with suitable examples.

(i) CMP C **(Gr.III (10))** (ii) DAD rp **(Gr.II (19)) (ch.2/Appendix)** **(3)**

(c) Write a short note on Ethernet. **(ch.5/Q. 31)** **(3)**

(B) Answer any one of the following :

(a) Explain any four points to justify why wireless networks are useful. **(ch.5/Q. 3)** **(4)**

(b) What is a Hub ? Explain its types. **(ch.5/Q. 39)** **(4)**

Q. 5 **Answer any two of the following :**

(a) Write an assembly language program to count the number of times a data D5 H is found in a block of memory having starting address 3000 H. Length of the block is stored in 2FFF H. Store the result in memory location 2000 H. **(5)**

Ans. : **(Pl. refer. ch.2/ Q. 37)**

(b) Write a program in assembly language to find the product of two numbers stored in memory location C005 H and C006 H. Store the result in C000 H and C001 H. **(5)**

Ans. : **(Refer. Ch. 2Asscembly language Program 3)**

(c) Write an assembly language program to get a decimal sum of series of numbers whose length is stored in C000 H and series itself starts from C001 H. Store the result in C050 H and C051H. **(5)**

Ans. : **(Pl. refer. ch.2/ Q. 38)**

OR

Q. 5 **Answer any two of the following :**

(a) Write a program in assembly language to find the smallest number from a serial of numbers, whose length is stored in C000 H and the series itself begins from C001 H. Store the result in memory location C050 H. **(5)**

Ans. : **(Pl. refer. ch.2/ Q. 39)**

(b) Write an assembly language program to count the number of odd data bytes occuring in a block starting from memory location 7501 H to 75FF H. Store the result at memory location 7600 H.

Ans. : **Pl. Refer . ch-2/ Q. 23)** **(5)**

(c) A block of data is stored in memory from D001 H. The length of block is stored in D000 H. Another block of same length is stored from D101 H. Write a program in assembly language to exchange the contents of these two blocks. **(5)**

Ans. : **Refer chapter 2 assembly language program (5))**

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Oct. 2005

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	–	–	04	12	–	–	–	–	12
2	Instruction Set and Programming of 8085	01	01	03	09	02	08	06	30	48
3	Introduction to INTEL X-86 Family	01	01	01	03	01	04	–	–	08
4	Introduction of Microcontroller	01	01	01	03	01	04	–	–	08
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1 **(A) Select the correct alternative and rewrite the following :**

(a) The instruction which does not affect, only carry flag is ______ **(1)**

(i) DAD (ii) XRA (iii) CMP (iv) INR

(b) The Intel 80286 is a _____ microprocessor. **(1)**

(i) 16 bit (ii) 8 bit (iii) 32 bit (iv) None of these

(c) Intel 8051 has clock upto ______ frequency. **(1)**

(i) 12 MHz (ii) 4 MHz (iii) 9 MHz (iv) 6 MHz

(d) The cellphone or mobile phone uses ____ transmission technology. **(1)**

(i) Radio (ii) Microwave (iii) Infrared (iv) Satellite

Ans. : a) INR b) 16 bit c) 12 MHz (d) Microwave

(B) **Answer any two of the following :**

(a) Draw the diagram of CPU registers of Intel 8085 with function of each register. **(ch.1/Q. 32)** **(3)**

(b) Explain how many times the following loop will be executed :

```
        LXI B, 0007H
Loop    DCX B
        MOV A, B
        ORA C
        JNZ     Loop
```

(3)

(c) What is interrupt ? Why the interrupt signals are used by peripheral device ? What is nonmaskable interrupt ? **(ch. 1Q. 27&Q. 21)** **(3)**

Q. 2 (A) Answer any two of the following :

(a) Explain the function of the following pins of Intel 8085 microprocessor. **(3)**

(i) ALE **(ch. 1, Q. 9)** (ii) $\overline{\text{INTA}}$ **(ch. 1, Q. 16)** (iii) READY **(ch.1, Q. 11(1))**

(b) Explain the use of stack and stack pointer register in Intel 8085. **(ch.2/Q. 13)** **(3)**

(c) List any three primary functions of CPU of microcomputer. **(ch.1/Q. 4)** **(3)**

(B) Answer any one of the following :

(a) What do you understand by register indirect and implicit addressing modes ? Explain with suitable examples. List the names of any four instructions which make accumulator content clear. **(ch.2/Q. 4)** **(4)**

(b) For the following instructions, write the addressing mode, instruction group and the length of the instruction (in terms of bytes). **(ch.2Q. 25)** **(4)**

(i) LHLD ABCDH (ii) LDAX B (iii) LXI H, BABAH (iv) SPHL

Q. 3 (A) Answer any two of the following :

(a) The following instructions are intended to clear ten (10) memory locations starting from the memory address 0009H. Explain why a large memory block will be erased or cleared and the program will stay in an infinite loop. **(ch.2/Q. 26)** **(3)**

```
        LXI H, 0009H
Loop    MVI M, 00H
        DCX H
        JNZ Loop
        HLT
```

Define a microcontroller. State any four advantages over microprocessor. **(ch.4/Q. 2)** **(3)**

Draw a neat labeled diagram of 32-bit flag register of X86 family. **(ch.3/Q. 15)** **(3)**

Answer any one of the following :

(a) Explain the programming model for 32-bit version of X86 family with suitable diagram. **(ch.3/Q. 12)** **(4)**

(b) Give any eight features of Intel 8051. **(ch.4/Q. 3)** **(4)**

Q. 4 (A) Answer any two of the following :

(a) Explain bandwidth, attenuation and electromagnetic interference. **(ch.5/Q. 4)** **(3)**

(b) Compare the characteristics of fiber optic cable and co-axial cable. **(ch.5/Q. 15)** **(3)**

(c) What do you mean by computer network ? Give any four advantages of computer networks. **(ch.5/Q. 6)** **(3)**

Q. 5 Answer any two of the following :

(a) Write an assembly language program to separate two nibbles of an 8-bit number stored in memory location 1500H. Add these two nibbles and store the sum in memory at BABAH location. **(5)**

Ans. : (Pl. refer. ch.2/ Q. 40)

(b) Write an assembly language program to convert the given 8-bit number stored in memory location ABCDH into ASCII format and store the ASCII value at location ABCEH and ABCFH. **(5)**

Ans. : (Pl. refer. ch.2/ Q. 41)

(c) Write an assembly language program to check the validity of each number of the given series. The series is stored in memory location starting from ABCDH to ABDDH. A number is said to be valid if 4 LSB's are greater than 4 MSB's. If the number is valid, then store 11H on that location. Otherwise store 00H on the same location. **(5)**

Ans. : (Pl. refer. ch.2/ Q. 42) **OR**

Q. 5 Answer any two of the following :

(a) Write an assembly language program to perform the addition of 06H data to accumulator if auxiliary carry flag is set. Store this sum in memory at BABAH. **(5)**

Ans. : (Pl. refer. ch.2/ Q. 43)

(b) A set of eight data bytes are stored in memory starting from ABCDH. Write an assembly language program to add two bytes at a time and store the sum in the same memory location, low order sum replacing the first byte and carry replacing second byte. If any pair does not generate a carry, the memory location of second byte should be cleared. **(5)**

Ans. : (Pl. refer. ch.2/ Q. 44)

(c) Write a subroutine labelled 'FIND' to search the largest element from a given unsigned series stored in memory location from ABBAH to ABCDH. Store the largest element at ABCEH and its address in HL register pair. **(5)**

Ans. : (Pl. refer. ch.2/ Q. 45)

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March 2006

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	04	12	02	08	–	–	21
2	Instruction Set and Programming of 8085	01	01	04	12	–	–	06	30	43
3	Introduction to INTEL X-86 Family	–	–	–	–	01	04	–	–	04
4	Introduction of Microcontroller	01	01	01	03	01	04	–	–	08
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1 **(A) Select the correct alternatives and rewrite the following :**

(a) _____ flag bit is reset, when flag resister content is D4H. **(1)**

(i) S (ii) Z (iii) CY (iv) AC

(b) ____ IC consists internal RAM. **(1)**

(i) 8080 (ii) 8085 (iii) 8051 (iv) 8086

(c) _____ does not regenerate the computer signal in networks. **(1)**

(i) Passive Hub (ii) Active Hub (iii) Repeater (iv) All the three

(d) ____ instruction rotates the contents of ACC left through carry by 1 bit. **(1)**

(i) RLC (ii) RRC (iii) RAR (iv) RAL

Ans. : a) CY b) 8051 c) Passive Hub d) RAL

(B) **Answer any two of the following :**

(a) Describe in brief the functions of the following pins of 8085 : **(ch.1/Q. 8(1))** **(3)**

(i) RD **(Q. 9(ii))** (ii) CLKOUT **(Q. 16)** (iii) ALE **(Q. 9(i))**

(b) Explain the addressing modes of the following instructions of 8085 with suitable examples: **(Ch.2/ Appendix)** **(3)**

(i) SHLD **(I(10))** (ii) LDAX **(I(11))** (iii) STC **(Gr.III(19))**

Q. 2 **(A) Answer any two of the following.**

(a) Explain the working of generic ALU with a suitable example. **(ch.1/Q. 31)** **(3)**

(b) Explain the working of following 8085 instructions with suitable examples :

(i) PUSH **(Ch.2V(1)P2-52)** (ii) SPHL **(Ch.2/V(6))** (iii) XRA **(ch.2 III(7)/)** **(3)**

(c) Compare STP and Co-axial Cable with reference to any three characteristics of transmission media. **(ch.5/Q. 8&Q. 11)** **(3)**

(B) Answer any one of the following :

(a) Explain the four primary functions of a generic microprocessor. **(ch.1/Q. 4)** **(4)**

(b) Explain the following terms of advance X86 family microprocessors :

(i) Branch prediction (ii) Dual pipeline

(iii) 64 bit data bus (iv) On chip cache **(ch.3/Q. 8)** **(4)**

Q. 3 (A) Answer any two of the following :

(a) Explain the following blocks of 8085 microprocessor : **(ch.1/Q. 34)** **(3)**

(i) Serial I/O Control (ii) Accumulator

(iii) Multiplexed Address / Data Bus Buffer **(ch.1/Q. 36)**

(b) Draw bit pattern of flag register and explain the significance of each flag bit. **(ch.1/Q. 39)** **(3)**

(c) Explain Router and Modem with their uses. **(ch.5/Q. 37 & Q. 40)** **(3)**

(B) Answer any one of the following :

(a) List all hardware interrupts of 8085 with their vector addresses. List them according to their priority. Explain maskable and non-maskable interrupts. **(ch.1/Q. 27&Q. 22)** **(4)**

(b) What is Microcontroller ? Explain any two expanded features of 8052 over 8051 microcontroller. **(ch.4/Q. 9)** **(4)**

Q. 4 (A) Answer any two of the following :

(a) If ACC contains data BCH, register C contains ADH. What will be the content of accumulator after execution of each of the following instructions independently ? **(ch.2/Q. 21)** **(3)**

(i) SUB C (ii) CMA (iii) XRA C

(b) Explain conditional and unconditional branching instructions with suitable examples. List any two machine control group of instructions with suitable example. **(ch.2/Q. 10 &Appendix)** **(3)**

(c) Define Topology. Explain STAR Topology with its advantages. **(ch.5/Q. 23 & 25)** **(3)**

(B) Answer any one of the following :

(a) What do you mean by Networking ? State any three differentiation points between LAN and WAN. **(ch.5/Q. 7)** **(4)**

(b) Explain token passing or ring and contention access methods of networking. **(ch.5/Q. 34)** **(4)**

Q. 5 Answer any two of the following :

(a) Write an assembly language program to add all even numbers stored in a memory block of 10 locations starting from 2000H, store the two byte sum at memory location starting from 3000H. **(5)**

Ans. : (Pl. refer. ch.2/ Q. 46)

(b) Write a program to set the sign and zero flag bits of the flag register to '1' and reset to '0' the remaining flag bits. The content of accumulator should be AAH. Also the content of BC, DE and HL register pair should be same as that of PSW. **(5)**

Ans. : (Pl. refer. ch.2/ Q. 47)

(c) Write an assembly language program to fill up the memory block of 20 memory locations starting from 2000H, with data bytes 00H and FFH at every alternate memory locations. **(5)**

Ans. : (Pl. refer. ch.2/ Q. 48) **OR**

Q. 5 Answer any two of the following :

(a) A three byte number is stored in a memory with starting address 2000H. Write a program to check whether it is palindrome or not. If it is palindrome, then store 00H in register B else store FFH. **(5)**

Ans. : (Pl. refer. ch.2/ Q. 49)

(b) Write an assembly language program to separate the nibbles of a number stored at memory location 2000H. Multiply the separated nibbles and store the result at memory location 3000H. **(5)**

Ans. : (Pl. refer. ch.2/ Q -7 and make necessary changes.)

(c) A BCD number is stored at memory location 2000H. Write an assembly language program to convert it into hexadecimal number and store it is the next memory location. **(5)**

Ans. : (Pl. refer. ch.2/ Q. 50)

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Oct. 2006

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	05	15	02	08	–	–	24
2	Instruction Set and Programming of 8085	01	01	03	09	–	–	06	30	40
3	Introduction to INTEL X-86 Family	–	–	–	–	01	04	–	–	04
4	Introduction of Microcontroller	01	01	01	03	01	04	–	–	08
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1 **(A) Select the correct alternatives and rewrite the followings :**

(a) _______ register of 8085 is only used during arithmetical and logical operations and not for any other purpose. (i) ACC (ii) B (iii) TEMP (iv) SP **(1)**

(b) 8051 Micro-controller IC has _____ number of 8 bit I/O ports. **(1)**

(i) 1 (ii) 2 (iii) 4 (iv) 8

(c) _____ cable type support the greatest cable length for computer networking. **(1)**

(i) UTP (ii) STP (iii) Thicknet Co-axial (iv) Thinnet Co-axial

(d) AC contents remain unchanged on execution of instruction ____. **(1)**

(i) LDAX rp (ii) MOV A, M (iii) CMA (iv) CMP B

Ans. : a) TEMP b) 4 c) Thicknet Co-axial d) CMP B

(B) **Answer any two of the following :**

(a) Explain the read/write operation with reference to $IO/\overline{M}$, S_0 and S_1 pins of IC 8085. **(ch.1/Q. 20(II))** **(3)**

(b) Explain the addressing modes of following instructions : **(3)**

(i) LDA **(ch.2/7)** (ii) STAX **(ch.2/12)** (iii) CMA **(ch.2/17)**

(c) State three differences between 8051 and 8052 Micro-controllers. **(ch.4/Q. 8)** **(3)**

Q. 2 **(A) Answer any two of the following :**

(a) Draw a neat labelled diagram of generic micro-processor. **(ch.1/Q. 5)** **(3)**

(b) Explain the working of following 8085 instructions with suitable example : **(ch.2/Appendix)**

(i) XTHL **(Ch.2/V(5))** (ii) POP **(Ch.2/V(3))** (iii) ANI **(Ch.2/III(3))**

(c) Compare Fiber Optic and UTP Cables with reference to any three characteristics of transmission media. **(ch.5/Q. 15)** **(3)**

(B) Answer any one of the following :

(a) Draw a neat labelled diagram of generic ALU and explain its working. **(ch.1/Q. 30)** **(4)**

(b) State four differentiating features among any two X86 family micro-processor. **(ch.3/Q. 9)** **(4)**

Q. 3(A) Answer any two of the following :

(a) If Flag reg. contents are C1H and 84 H, then interpret its meaning separately. **(3)**

(b) Explain following registers of 8085 : **(ch.1/Q. 35)** **(3)**

(i) IR (ii) Stack Pointer (SP) (iii) PC

(c) Explain HUB and Repeater with their uses. **(ch.5/Q. 39)** **(3)**

(B) Answer any one of the following :

(a) What are Hardware and Software Interrupts ? List them with vector addresses. **(ch.1/Q. 22, 23 & 24)** **(4)**

(b) State any eight features of 8051 micro-controller. **(ch.4/Q. 3)** **(4)**

Q. 4 (A) Answer any two of the following :

(a) If ACC contains the data BBH and D_{req} = 99H; what will be the contents of the accumulator in hexadecimal after execution of each of the following instructions independently ? **(3)**

(i) ORA D = BBH (ii) RRC = DDH (iii) ADD D = 54H

b) Explain the following terms with suitable diagram : **(ch.1/Q. 55)** **(3)**

(i) Fetch Cycle (ii) Instruction Cycle (iii) Machine Cycle

(c) What do you mean by Topology ? Explain the BUS Topology with its advantages. **(ch.5/Q. 23)** **(3)**

(B) Answer any one of the following :

(a) Explain the following characteristics of transmission media : **(ch.5/Q. 3)** **(4)**

(i) Band Width (ii) Band Usage (iii) Attenuation (iv) EMI

(b) Write a short note on Co-axial Cable with suitable figure. **(ch.5/Q. 7)** **(4)**

Q. 5 Answer any two of the following :

(a) Write an assembly language program to add all odd numbers stored in memory block of 10 locations starting from 2000 H. Store the two byte sum at memory locations starting from 3000H. **(5)**

Ans. : (Pl. refer. ch.2/ Q. 51)

(b) Write an assembly language program to find the sum of first 10 numbers of the series 2^0, 2^1, 2^2, 2^3, ... Store the two byte result at memory locations starting from address 2000 H. **(5)**

Ans. : (Pl. refer. ch.2/ Q. 52)

(c) Write an assembly language program to find the occurrence of numbers divisible by 4 in a memory block of 10 locations starting from 2000 H. Store the count of occurrence at the end of block. **(5)**

Ans. : (Pl. refer. ch.2/ Q. 53) **OR**

Q. 5 Answer any two of the following :

(a) Write an assembly language program to generate the first ten numbers of Fibonacci series and store them in a memory block starting from 2000 H. **(5)**

Ans. : (Pl. refer. ch.2/ Q. 54)

(b) An ASCII code for a hexa-decimal digit is stored at memory location 2000 H. Write an assembly language program to convert it into hexa-decimal number and store it at 3000 H. **(5)**

Ans. : (Pl. refer. ch.2/ Q. 55)

(c) Write an assembly language program to count the number of 1's and 0's in a 8 bit binary number stored at memory location 2000 H. Store the counts for 0's and 1's in a memory location 2001 H and 2002 H respectively. **(5)**

Ans. : (Pl. refer. ch.2/ Q. 56)

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March 2007

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	–	–	04	12	01	04	–	–	16
2	Instruction Set and Programming of 8085	02	02	03	09	01	04	06	30	45
3	Introduction to INTEL X-86 Family	–	–	01	03	01	04	–	–	07
4	Introduction of Microcontroller	01	01	01	03	01	04	–	–	08
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1 (A) Select the correct alternatives and rewrite the following:

(a) The instruction which affects only carry flag is ______ 1

(i) OR (ii) XRI (iii) ADI (iv) DAD

(b) instruction uses flags. 1

(i) Data Transfer (ii) Arithmetical (iii) Conditional jump (iv) Logical

(c) Among following ___ is the latest 8-bit single chip microcontroller. 1

(i) 8048 (ii) 8051 (iii) 8096 (iv) 8044

(d) cable has highest bandwidth. 1

(i) UTP (ii) STP (iii) Co-axial (iv) Fiber Optic

Ans :	(a) DAD	(b) Conditional Jump	(c) 8051	(d) Fiber Optic

(B) Answer any two from the following:

(a) What do you mean by scratch pad register in Intel 8085 microprocessor? 3

Ans : Out of syllabus scope

(b) Define : (i) PSW (ii) MAR (iii) Stack Pointer **(Ch.1/Q. 33)** 3

(c) Explain any three addressing modes for Intel 8085 microprocessor with suitable example. **(Ch.2/Q. 2)** 3

Q. 2 (A) Answer any two from the following:

(a) Explain the difference between SUB and CMP instruction with suitable example. 3

Ans : Please refer chapter 2 Appendix

(b) Give the function of : 3

(i) Multiplexed bus AD_0 - AD **(Ch.1/Q. 17(ii))**

(ii) S_0, S_1 and IO/ M **(Ch.1/Q. 11(3)&Q. 15(a))**

(iii) HOLD and HLDA pins of Intel 8085 microprocessor.

Ans : (ch 1/ Q. 10(a)&Q. 11(4)

(c) Draw a timing diagram for instruction ADDB.

Ans : Out of syllabus & scope.

(B) Answer any one of the following:

(a) Explain the interrupt system of Intel 8085 microprocessor. 4

Ans : Chapter 1 : Question 21

(b) Explain stack operation of Intel 8085 system with illustrated example. 4

Ans : Ch. 2/Appendix V 1 & 3)

Q. 3 (A) Answer any two from the following:

(a) Explain the following Intel 8085 instructions: 3

(i) DAA

Ans : Please refer chapter 2, Appendix Group II (20)

(ii) NOP

Ans : Please refer chapter 2, Appendix group V B (6)

(iii) LDAX D

Ans : Please refer chapter2, Appendix Group I (11)

(b) Draw a neat labelled diagram Of programming model of X86 family.

Ans : Please refer chapter 3, Question 12

(c) Give the features of Intel 8051 microcontroller.

Ans : Please refer chapter 4, Question 3

(B) Answer anyone from the following :

(a) List and explain any four prominent features of Pentium Processor.

Ans : Please refer chapter 3, Que: 8.)

(b) Give the differences between microprocessor and microcontroller.

Ans : Please refer chapter4, Que: 11.)

Q. 4 (A) Answer any two of the following:

(a) Compare and list any three points for the characteristics of fiber optic cable and co-axial cable.

Ans : Please refer chapter 5, Question 18

(b) Which networking topology is best? Why? Explain. **(Ch.5/Q. 30)**

(c) What is meant by a Protocol ? Explain the concept of TCP/IP protocol.

Ans Please refer chapter 5, Question 36.

(B) Attempt anyone of the following :

(a) Explain any four points to explain why wireless networks are useful?

Ans Please refer chapter 5, Question 3.

(b) Discuss any two Access Methods of Networking.

Ans Please refer chapter 5, Que. 34

Q. 5 Answer any two of the following:

(a) Write an assembly language program to shift 16-bit number by three bit left, stored in memory location starting from BABAH with LSB. Store the result starting from BADAH.

Ans: (Pl. refer. ch. 2/ Q - 57) 5

b) Write an assembly language program to sort 25 numbers in-ascending order stored in memory location from ABO1H and onward. Store the sorted data in memory from BCO1H and onward. 5

Ans : (Pl. refer. ch. 2/ Q - 58)

c) Write an assembly language program to fill the memory location starting from ABOOH and onward with decimal number from 0 to 99. 5

Ans : (Pl. refer. ch. 2/ Q - 59)

Q. 5 Answer any two of the following:

(a) Write an assembly language program to find greatest and smallest from a given series stored in memory location from BABAH to BADAH Store the smallest number at BADBH and greatest number at BADCH. 5

Ans : (Pl. refer. ch. 2/ Q - 60)

b) Write an assembly language program to add two 8-bit numbers stored in memory location ABCDH and ABCEH. Store the sum in memory at ABDDH and the flag status at location ABDCH. 5

Ans : (Pl. refer. ch. 2/ Q - 61)

c) Squares of decimal numbers from 0 to 9 are stored in memory from 1500H to 1509 H respectively. Write an assembly language program to find the square of a given decimal number by look up table method given in the above range and is stored at 14F2H. Store the square of iven number in memory at 14F3H. 5

Ans : (Pl. refer. ch. 2/ Q - 62)

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Oct. 2007

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	04	12	02	08	–	–	21
2	Instruction Set and Programming of 8085	01	01	04	12	–	–	06	30	43
3	Introduction to INTEL X-86 Family	–	–	–	–	01	04	–	–	04
4	Introduction of Microcontroller	01	01	01	03	01	04	–	–	08
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1 (A) Select the correct alternatives and rewrite the following :

(a) __________ is a 32 bit microprocessor. 1

i) 8086 ii) 80386 iii) Intel Pentium iv) M68000

(b) The instruction that can affect stack pointer is __________. 1

i) SHLD ii) XCHG iii) LXI iv) LDAX

(c) In 8051 size of internal ROM is ________. 1

i) 4KB ii) 2KB iii) 8KB iv) 16KB

(d) The Transmission Rate of ________ is typical for fiber optic cables. 1

i) 10 Mbps ii) 25 Mbps iii) 100 Mbps iv) 5000 Mbps

Ans : a) 80386 b) LXI c) 4KB d) 100 Mbps

(B) Answer any two of the following :

(a) Write a short note on Evolution of Microprocessor. 3

Ans : Please refer to chapter 1, Question 2

(b) State Register and Direct Addressing Modes of 8085. Give at least two examples in eachcase. 3

Ans : Please refer chapter 2, Question 2

(c) Write a six features of 8051 Microcontroller. 3

Ans : Please refer chapter 4, Question 3

Q. 2 (A) Answer any two of the following :

(a) Explain the function of the following with respect to 8085 Microprocessor.

i) Instruction Decoder ii) ALU iii) Three Bus Structure

Ans : Please refer chapter 1, Question 35&36

(b) Explain the following instructions of 8085 Microprocessor with suitable example of each

i) LDAX rp ii) STAX rp iii) SHLD addr

Ans : i) 11 ii) 12 iii) 10

(c) Define Topology. Explain STAR and Bus Topologies with diagram. 3

Ans : Please refer to chapter 5, Question 23 & 25

(B) Answer any one of the following :

(a) Draw the block diagram of Microcomputer and state the function of each block in brief.

Ans : Please refer to chapter 1, Question 3

(b) Explain the Memory Register Mapping of 8051 with a suitable diagram.

Ans : Please refer to chapter 4, Question 5

Q. 3 (A) Answer any two of the following :

(a) Write a short note on Flags in 8085 Microprocessor.

Ans : Please refer to chapter 1, Question 39

(b) Describe in brief the function of the following pins of 8085 Microprocessor :

i) ALE **(Ch.1/Q. 9(1))**

ii) $\overline{\text{RESET IN}}$ **(Ch.1/Q. 10(c))** iii) SOD **(Ch.1/Q. 15(c))**

(c) Explain in short the six important characteristics of Transmission Media.

Ans : Please refer to chapter5, Question 1

(B) Answer any two of the following :

(a) What do you meant by 'Interrupt'. Write a short note on Hardware Interrupt and Soft ware Interrupts.

Ans : Please refer to chapter 1, Question 21 & 24

(b) Explain the programming model for 32-bit version of X-86 family with suitable diagram.

Ans : Please refer to chapter 3, Question 12

Q. 4 (A) Answer any two of the following :

(a) The accumulator of 8085 processor contains the data ABH and register B contains BAH. What will be the contents of accumulator after execution of each of the following instructions independently.

i) ORA B ii) XRA B iii) ANI OFH

Ans : Please refer to chapter 2, Question 23, 23

(b) Explain the following instruction of 8085 Microprocessor with suitable example of each:

i) STAX ii) LDA iii) SBB r

Ans. : i) 12 ii) 7 iii) 10

(c) Explain the Ring Topology and Token Passing.

Ans : Please refer to chapter 5, Question 33

(B) Answer any one of the following :

(a) Write the function of each of the following devices in short : 4

i) modem ii) router iii) hub iv) repeater

Ans : Please refer to chapter 5, Question 41

(b) Compare any four attributes of UTP and Optical Fiber Cable. 4

Ans : Please refer to chapter 5, Question 15

Q. 5 Answer any two of the following :

(a) Write an assembly language program to count number of odd data bytes in the block of memory starting from 1300H to 13FFH and output on port 11H.

Ans : Please refer to chapter 2, Question 63

(b) Write a program segment using appropriate 'Rotate' instruction to divide the number in BC register pair by 2. The quotient should remain in BC register pair.

Ans : Please refer to chapter 2, Question 64

(c) Write an assembly language program to count how many times 05H comes in a memory block starting at 4000H to 4004H. Store the result at 4070H.

Ans : Please refer to chapter 2, Question 65 **OR**

Q. 5(a) Write a program segment to find the largest number in a series. The length of the series is stored at 2500H and the numbers are stored from 2501H. Store the result at 2405H. 5

Ans : Please refer to chapter 2, Question 66

(b) Trace the following program and write the purpose of the program : 5

Ans : Please refer to chapter 2, Question 67

(c) Sixteen bytes of data are stored in memory locations at C050H to C05FH. Transfer the entire block of data to new memory location starting at C070H. 5

Ans : Please refer to chapter 2, Question 68

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March 2008

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	05	15	02	08	–	–	24
2	Instruction Set and Programming of 8085	01	01	03	09	–	–	06	30	40
3	Introduction to INTEL X-86 Family	–	–	–	–	01	04	–	–	04
4	Introduction of Microcontroller	01	01	01	03	01	04	–	–	08
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1 (A) Select the correct alternatives and rewrite the following statements :

(a) The 8051 internal ROM is ———. 1

(i) Found in the Data Memory Space

(ii) Used to store variable program data

(iii) 4 kBytes of ROM in the Program Memory Space

(iv) All of the above

Ans : a) 4 kBytes of ROM in the Program Memory Space

(b) The instruction ——— will affect the zero flag without changing the contents of the accumulator. 1

(i) MVI A, 00 (ii) SUB A (iii) XRA A (iv) CMP A

Ans : b) CMP A

(c) ———— bus is one way data path from MPU to all devices. 1

(i) Data (ii) Address (iii) Control (iv) None of these

Ans : Address

(d) Most widely used and economical cable for network installation is ————. 1

(i) Fiber-Optic (ii) UTP (iii) STP (iv) Co–axial

Ans : Co-axial

(B) Answer any two of the following :

(a) Draw a neat labelled functional block diagram of 8085 Microprocessor. 3

Ans : Please refer chapter 1 : Question 29

(b) Write a short note on Evolution of Microprocessor giving one example of each generation. 3

Ans : Please refer chapter 1: Question 2

(c) Draw a neat labelled diagram of 8051 Memory Register Map. 3

Ans : Please refer chapter 4 : Question 5

Q. 2 (A) Answer any two of the following :

(a) Describe the following instruction of 8085 Microprocessor : 3

(i) XCHG (ii) RAR (iii) ADC r

(i) 13 (ii) 16 (iii) 4

Ans : Please refer chapter 2 Appendix,

(b) Compare the characteristics of Fiber-Optic and Co-axial Cable. Mention at least three points. 3

Ans : Please refer chapter 5 : Question 18

(c) Write the features of 8085 Microprocessor. 3

Ans : Please refer chapter 1 : Question 7

(B) Answer any one of the following :

(a) What is the function of the following units in 8085 Microprocessor : 3

(i) Program Counter (ii) Stack Pointer

(iii) Incrementer/Decrementer (iv) General Purpose Register

Ans : Please refer chapter1, Question 34 & 35

(b) Explain the programming model of 32 bit version of X86 family of Microprocessors. 4

Ans : Please refer chapter 3, Question 12

Q. 3 A) Answer any two of the following :

(a) Describe in brief the function of the following pins of 8085 Microprocessor : 3

i) HLDA (ii) READY (iii) RST 7.5

Ans : Please refer chapter1 : Question 11

(b) List any three primary functions of the CPU of the Microcomputer. 3

Ans : Please refer chapter 1 : Question 4

(c) Explain RING Topology and Token Passing. 3

Ans : Please refer chapter 5 : Question 33

(B) Answer any one of the following :

(a) Write a short note on Flag Register of 8085 Microprocessor. Explain the significance of flag bits with one example. 4

Ans : Please refer chapter 1, Question 39 & 42

b) Explain the Memory Register Map of 8051 Microprocessor with the help of a neat diagram. 4

Ans : Please refer chapter4 : Question 5

Q. 4 A) Answer any two of the following :

(a) The accumulator contains the data AB_H. What will be the contents after the execution of the following instructions independently : 3

(i) XRI $B5_H$ (ii) CMA (iii) SUB A

Ans : (i) 1 E_H (ii) 54H (iii) 00H

(b) Explain the following instructions of 8085 Microprocessor with suitable example : 3

(i) DAA (ii) LHLD

Ans : Please refer chapter 2 : Appendix (i) 20 (ii) 9

(c) What is meant by Protocol? Explain the concept TCP/IP Protocol. 3

Ans : Please refer chapter 5 : Question 36

(B) Answer any one of the following :

(a) Explain the following characteristics of Transmission Media : 4

i) Band width ii) Band usage

iii) Attenuation iv) Immunity for Electromagnetic Induction

Ans : Please refer chapter 5, Question 4

(b) Write the function of each of the following devices in short : 4

i) Modem ii) Repeater iii) Hub iv) Router

Ans : Please refer chapter 5, Question 41

Q. 5 Answer any two of the following :

(a) Write as assembly language program to copy a block of data having starting address 2000H to a new destination with starting address 3000H. Length of the block is stored at 1FFFH. 5

Ans : Please refer to ch. 2, Que. 69

(b) A block of data is stored in memory starting from memory location D001H. The length of the block is stored at memory location D000H. Write an assembly language program to sort the contents of block in ascending order. 5

Ans : Please refer to ch. 2, Que. 70

(c) Write an assembly language program to exchange the two hexadecimal digits of a number stored at memory location 2500H. Store the new number at memory location 2501H. 5

Ans : Please refer to ch. 2, Que. 71

OR

Q. 5 Answer any two of the following :

(a) A block of data is stored in memory locations from $C080_H$. Length of block is stored at C07FH. Write an assembly language program that searches for the first occurrence of data byte ABH in the given block. Store the address of the occurrence in HL register pair. If number is not found, then HL register pair must contain FFFFH. 5

Ans : Please refer to ch. 2, Que. 72

(b) Write an assembly language program to perform the multiplication of two eight bit numbers where multiplicand is stored at memory location 2501H and 2502H. Multiplier is stored at 2503H. Result is to be stored at memory location 2504H and 2505H. 5

Ans : Please refer to ch. 2, Que. 73

(c) Write a sub-routine to fill the memory locations 2800H to 28FFH with the hexadecimal numbers 00H to FFH respectively. 5

Ans : Please refer to ch. 2, Que. 74

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Oct. 2008

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	04	12	02	08	–	–	21
2	Instruction Set and Programming of 8085	01	01	04	12	–	–	06	30	43
3	Introduction to INTEL X-86 Family	–	–	–	–	01	04	–	–	04
4	Introduction of Microcontroller	01	01	01	03	01	04	–	–	08
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1 **(A) Select correct alternatives and rewrite the following sub-questions :**

(a) which of the following is not a part of an 8051 Single-chip Microprocessor ? 1

(i) A 4-kbyte ROM (ii) Dual Serial Port

(iii) A 128 –byte RAM (iv) Four 8-bit parallel I/o ports

(b) XCHG instruction exchanges 16-bit data between ________. 1

(i) DE and HL Register Pair (ii) BC and HL Register Pair

(iii) BC and DE Register Pair (iv) All of the above Register Pairs

(c) TRAP is a non-maskable interrupt with ______ priority. 1

(i) highest (ii) lowest

(iii) intermediate (iv) no

(d) If the network is to be executed beyond predefined cable limit, ________ is used. 1

(i) Modem (ii) Repeater

(iii) Hub (iv) Router

Ans. (a) (ii), (b) (i), (c) (i), (d) (ii)

(B) **Answer any two of the following :**

(a) Draw a neat labelled diagram of Microcomputer System. 3

Ans: **Please Refer Chapter 1 Que 3**

(b) Explain Register Indirect and Immediate Addressing Mode in case of 8085 Microprocessor with the help of suitable example. 3

Ans: **Please Refer Chapter 2 Que 3**

(c) State the features of 8051 Microcontroller. 3

Ans: **Please Refer Chapter 4 Que 3**

Q. 2 **(A) Answer any two of the following :**

(a) Describe the following instructions of 8085: 3

(i) LHLD

Ans: **Please Refer Chapter 2 Appendix** 3

(ii) STAX

Ans: **Please Refer Chapter 2 Appendix** 3

(iii) LXI

Ans: **Please Refer Chapter 2 Appendix**

(b) Compare the characteristic of Fiber Optic and UTP cable. Mention atleast 3 points. 3

Ans: **Please Refer Chapter 5 Que 15**

(c) Explain the organisation of ALU with the help of simple block diagram. 3

Ans: **Please Refer Chapter 1 Que 31**

(B) Answer any one of the following :

(a) Write the function of the following units in 8085 Microprocessor **4**

(i) Accumulator (ii) Stack pointer

(iii) Instruction Decoder (iv) Serial I/O controller

Ans: Please Refer Chapter 1

i) Que 34 (i) **ii) Que 35 (b)**

iii) Que 35 (c) **iv) Que 34 (v)**

(b) Explain the advantages of the following features of the Pentium Processor: **4**

(i) Dual - Pipelining (ii) On chip Cache

(iii) Branch Prediction (iv) 64 bit Data Bus

Ans: Please Refer Chapter 3 Que 8

Q. 3 (A) Answer any two of the following :

(a) Describe in brief the function of the following pins in 8085 Microprocessor: **3**

(i) HOLD (ii) INTR (iii) RESET $\overline{\text{IN}}$

Ans : Please Refer Chapter 1 Que 10

(b) What is Flag register ? Explain its uses in ALU operation giving one example. **3**

Ans: Please Refer Chapter 1 Que 39 & 42

(c) Define Bus, Ring and Star Topologies. Draw suitable diagram for each. **3**

Ans : Please Refer Chapter 5 Que 29

(B) Answer any one of the following:

(a) Explain any 3 flags available in 8085 if flag register contains CAH, interpret its meaning

Ans: Please Refer Chapter 1 Que 49 **4**

(b) Explain various applications of Microcontroller. **4**

Ans : Please Refer Chapter 4 Que 10

Q. 4 (A) Answer any two of the following :

(a) Accumulator of 8085 contains data E3H. What will be the contents of accumulator after stepwise execution of each of the following instructions :. **3**

(i) ANI 58 H (ii) RRC (iii) CMA

Ans : Please Refer Chapter 2 Que 15

(b) Explain the following instructions of 8085 Microprocessor with suitable example: **3**

(i) SPHL (ii) PCHL

Ans : Please Refer Chapter 2 Que 8

(c) Explain the following access method in brief : **3**

(i) Contention (ii) Token passing

Ans : Please Refer Chapter 5 Que 34

(B) Answer any one of the following :

(a) Write in short the function of each of the following devices : 4

(i) Modem (ii) Router (iii) Hub (iv) Repeater

Ans : Please Refer Chapter 5 Que 41

(b) Write a short note on Ethernet. 4

Ans : Please Refer Chapter 5 Que 31

Q. 5 Answer any two of the following

(a) Write an assembly language program to find how many times data BCH appears in a memory block D050H to D059H. Store the count in register C. 5

Ans : Please Refer Chapter 2 Que 75

(b) Write an assembly language program to find the largest number in a block of data starting from the address 3500H. Length of the block is stored at memory location address 34FFH. Store the result at address 4500H. 5

Ans : Please Refer Chapter 2 Que 76

(c) Write an assembly language program to add two BCD numbers stored at locations 3500H and 3501H. Place the BCD result in location 3502H and onward with LSB first. 5

Ans : Please Refer Chapter 2 Que 77

OR

Q. 5 Answer any two of the following :

(a) Write an assembly language program to subtract the number stored in memory location 3601H from the number stored in memory location 3600H. Store positive result at location 3602H. 5

Ans : Please Refer Chapter 2 Que 78

(b) Write an assembly language program to divide a byte stored at location 2050H by a non zero byte stored at location 2051H. Place the quotient at memory location 2052H and the remainder at location 2053H. 5

Ans : Please Refer Chapter 2 Que 79

(c) Write an assembly language program to transfer a block of data stored in memory location from D100H to D1FFH in reverse order in new memory location starting at D200H. 5

Ans : Please Refer Chapter 2 Que 80

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March 2009

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	03	09	02	08	–	–	18
2	Instruction Set and Programming of 8085	01	01	05	15	–	–	06	30	46
3	Introduction to INTEL X-86 Family	–	–	–	–	01	04	–	–	04
4	Introduction of Microcontroller	01	01	01	03	01	04	–	–	08
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1 **(A) Select the correct alternatives and rewrite the following :**

(a) In case of 8085 microprocessor, data bus between ALU and accumulator is ______. 1

(i) Bidirectional (ii) Unidirectional

(iii) Either Unidirectional or Bidirectional

(iv) Neither Unidirectional nor Bidirectional

b) The additional feature of 8051 Microcontroller over 8085 Microprocessor is that, it has additional __________. 1

(i) Internal RAM only (ii) Internal ROM only

(iii) 16 bit ALU (iv) Both Internal RAM and ROM

(c) In case of 8085 instructions, STC is an example of __________ addressing mode. 1

(i) Direct (ii) Register (iii) Implied (iv) Immediate

(d) Electromagnetic Interference is minimum in case of __________ cable. 1

(i) UTP (ii) STP (iii) Fiber Optic (iv) Co-axial

Ans. (a) Bidirectional, (b) Both Internal RAM and ROM, (c) Implied, (d) Fiber Optic

(B) Answer any two of the following:

(a) Explain in brief the organization of ALU with a simple functional block diagram. 3

Ans. **Please Refer Chapter 1 Que 31**

(b) Explain with suitable examples the

(i) Immediate

(ii) Direct Addressing Modes of 8085 Microprocessor 3

Ans. **(i) Please Refer Chapter 2 Que 3**

(ii) Please Refer Chapter 2 Que 2 (I)

(c) Explain the following characteristics of Transmission Media: 3

(i) Band Usage (ii) Attenuation

(iii) Electromagnetic Interference

Ans. **Please Refer Chapter 5 Que 4**

Q. 2 **(A) Answer any two of the following:**

(a) Draw a neat simplified block diagram of CPU Architecture of Micro-computer. 3

Ans. **Please Refer Chapter 1 Que 5**

(b) Explain the following instructions of 8085 Microprocessor with examples : 3

(i) SBB r (ii) STC (iii) PUSH PSW

Ans. **i) Please Refer Chapter 2 Appendix II (10)**

ii) Please Refer Chapter 2 Appendix III (19)

iii) Please Refer Chapter 2 Appendix V (2)

(c) Explain twisted pair cable with a suitable figure. 3

Ans. **Please Refer Chapter 5 Que 10**

(B) **Answer any one of the following:**

(a) Compare any four attributes of 8086 Microprocessor with Pentium Processor. 4

Ans. **Please Refer Chapter 3 Que 3 (I & V)**

(b) Define the Bit Pattern of Flag Register and explain the significance of each flag bit. 4

Ans. **Please Please Refer Chapter 1 Que 39**

Q. 3 **(A) Answer any two of the following :**

(a) Describe in brief the function of the following pins of 8085 Microprocessor. 5

(i) HOLD

Ans. **Please Refer Chapter 1 Que 10**

(ii) $\overline{\text{RESET IN}}$

Ans. **Please Refer Chapte 1 Que 10 (c)**

(iii) ALE

Ans. **Please Refer Chapter 1 Que 9 (i)**

(b) The accumulator of 8085 Microprocessor contains the data $E5_H$ and register B contains $3E_H$. What will be the content of the accumulator after execution of each of the following instructions independently? 3

(i) ANA B = 24H (ii) XRA B = DBH (iii) SUB B= A7H

(c) Compare at least three characteristics of UTP and Optical Fibre Cable. 3

Ans. **Please Refer Chapter 5 Que 15**

B) Answer any one of the following :

(a) What are Hardware and Software Interrupts? List them with their vector addresses in case of 8085 Microprocessor. 4

Ans. Please Refer Chapter 1 Que 23, 23 & 24

(b) Explain memory mapping of 8051 Microcontroller with the help of neat diagram. 4

Ans. Please Refer Chapter4 Que 5

Q. 4 (A) Answer any two of the following :

(a) Explain the following instructions of 8085 Microprocessor with suitable examples : 3

i) XTML ii) XCHG

Ans. Please Refer Chapter 2. Appendix

i) XTHL : Group V A(5)

ii) XCHG : Group I (13)

(b) In case of 8085 Microprocessor, explain unconditional and conditional call instructions with suitable examples. 3

Ans. Please Refer Chapter 2 Que. 11

(c) State atleast six important features of 8051 Microcontroller. 3

Ans. Please Refer Chapter 4 Que. 3

B) Answer any one of the following :

(a) Explain RING Topology with necessary diagram and state its important advantages. 4

Ans. Please Refer Chapter 5 Que. 24

(b) Explain the following devices of computer networking : 4

(i) Hub (ii) Repeater

Ans. Please Refer Chapter 5 Que. 39

Q. 5 Answer any two of the following :

(a) A block of data is stored in memory locations from 8101 H to 81FF H. Write an assembly language program to transfer the block in reverse order to Memory locations 8200 H and onwards.

Ans. Pl Refer .Ch.2/ Q. 80 and make necessary changes. 5

(b) Write an assembly language program to count the number of even data bytes occuring in a block starting from the memory location 7501 H to 75FF H. Store the result at the memory location 7600 H. 5

Ans. Please Refer Chapter 2 and make necessary changes.

(c) Write an assembly language program that divides two one byte hex numbers where dividend is stored in memory locations 8000 H and divisor is stored in memory location 8001 H Store quotient and remainder in memory location 8002 H and 8003 H respectively. 5

Ans. (Please Refer ch. 2/ Q. 79) and necessary changes

Q. 5 Answer any two of the following :

(a) Write an assembly language program to exchange 8 bit number stored in memory location 4000 H. Store new number at memory location 4001 H. 5

Ans. (Please Refer ch. 2/ Q. 81) and necessary changes

(b) Write an assembly language program to separate the nibbles of a number stored at memory location 4000 H. Multiply the separated nibbles and store the result at memory location 5000 H.

Ans. (Please Refer ch. 2/ Q. 7) and necessary changes 5

(c) Write an assembly language program to subtract the number stored in memory location ABB8 H from the number stored in memory location ABB7H. Store the positive result at location ABB9 H. 5

Ans. Please Refer Question paper October 2008 (Que. 5 (a)

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Oct. 2009

Distribution of Marks- Questionwise and Topicwise

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4	Introduction of Microcontroller	01	01	03	09	–	–	–	–	10
5	Networking Technology	01	01	03	09	01	04	–	–	14
	Total	04	04	12	36	06	24	06	30	94

Q. 1 (A) Select the correct alternative and rewrite the following :

(a) Addressing Mode of ADD M is ______ **(1)**

(i) Direct (ii) Register Indirect (iii) Implied (iv) Immediate

(b) The Processor 80386 falls in ______ generation of MPU. **(1)**

(i) First (ii) Second (iii) Third (iv) Fourth

(c) Internal program memory of 8052 Microcontroller is ______ **(1)**

(i) 4 k byte (ii) 8 k byte (iii) 256 k byte (iv) 64 k byte

(d) In TCP/IP is _______ protocol. (1)

(i) Connectionless (ii) Connection Oriented

(iii) Address Resolution (iv) Datagram

Ans. :	(a) ii	(b) iv	(c) ii	(d) i

(B) Answer any two of the following

(a) Give function of the following registers of 8085 MPU : 3

i) IR **(Pl. refer ch.1/ Q - 35(c))**

ii) PC **(Pl. refer ch.1/ Q - 35(d))**

iii) Accumulater **(Pl. refer ch1/Q -34(1))**

(b) Flag Register contains data 15 H, then interpretes its meaning.

(Pl. refer ch. 1/ Q. 50)

(C) Compare 8051 and 8052 Microcontrollers. **(Pl. refer ch. 4/Q. 8)** (3)

Q. 2 (A) Solve any two of the following :

a) State any six advance features of X -86 Micropreocessor Family. 3

Ans : (Pl. refer ch. 3/ Q. 11)

b) State features of 8051 Microcontroller **(Pl. refer ch.4/Q -3)** 3

c) Compare between UTP and STP Cable. **(Pl. refer ch.5/Q -13)** 3

B) Solve any one of the following :

a) Write note on Evolution of Micropreocessor. 4

(Pl. refer ch.1/Q -2)

b) Explain functions of the following pins of 8085 4

i) $\overline{RD}$ **(Pl. refer ch.1/Q -9 (ii))**

ii) HLDA **(Pl. refer ch.1/Q 11 (4))**

iii) READY **(Pl. refer ch.1/Q -11 (1))**

iv) SOD **(Pl. refer ch.1/Q -15 (C)** (3)

Q. 3 (A) Solve any two of the following :

a) Explain function of Router in Network and list different types of Routers. (3)

(Pl. refer ch.5 /Q. 40)

b) Explain following instructions with example : (3)

i) RAL **(Pl. refer ch.2/ Appendix Gr.(III) (15))**

ii) DAD rp **(Pl. refer ch.2 /Appendix Gr. (II) (19))**

c) State atleast six applications of Micrao- controller. (3)

(Pl. refer ch 4/Q -10)

B) Solve any one of the following :

a) What is Topolgy ? Give different types of Network Topologies ? (4)

Explain Bus Topology. **(Pl. refer ch. 5/Q. 22&23)**

b) Draw and explain Programming Model of 8085 MPU. **(4)**
(Pl. refer Ch.1/Q. 32)

Q. 4 (A) Solve any two of the following .

a) Explain Direct and Register Indirect Addressing Modes of 8085 MPU. **(3)**
(Pl. refer ch.2/Q -2)

b) What is Interrupt ? List all Hardware Interrupts and give interrupt service routine address of each interrupt. **(Pl. refer ch.1/Q -21 & 22)** 3

c) List variours access methods in Network ? Explain any one method.
(Pl. refer ch.5/Q -34)

(B) Solve any one of the following :

a) Accumulator contains 45H [(A) =45] , Register E contains data 3BH [(E) =3B]. Write the contents of Accumulator after execution of following instructions independently :
i) SUB E ii) XRA E iii) RRC iv) MOV E,A

Ans : (Pl. refer ch.2/Q -34)

b) What is Branching ? Explain any one unconditional and two conditional branching instructions. **(Pl. refer ch.2/Q -10)**

Q. 5 Solve any two programmes of the following :

a) Write assembly language program to find sum of all the numbers stored in a memory block. Block starts from 2CO5H and length of the block is at 2CO4H. Store the sum at 2CO3H. **5**

Ans : Pl. Refer ch.2/Q.82

b) Write assembly language program to divide all the numbers of a block by 2. Block is from 4000H to 4009 H. **5**

Ans : Pl. Refer ch.2/Q.83

c) Write assembly language program to count number of one (1) in 8 bit number which is stored at 208BH.

Ans : Pl. Refer ch.2/Q.84

OR

Q. 5 Solve any two programmes of the following :

a) Write assmbly language program to fill memory block from 2000H to 2009 H with data BBH and 44H alternately.

Ans : Pl. Refer ch.2/Q.85

b) Write assembly language program to find smallest number in a memory block. Block starts from 2600H . Length of the block is at 25FFH. Store the smallest number in register E.

Ans : Pl. Refer ch.2/Q.86

c) Write assembly language program to arrange two numbers stored at 1201 H and 1202 H in descending order.

Ans : Pl. Refer ch.2/Q.87

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March 2010

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	02	02	05	15	02	08	–	–	25
2	Instruction Set and Programming of 8085	01	01	02	06	01	04	06	30	41
3	Introduction to INTEL X-86 Family	–	–	01	03	01	04	–	–	07
4	Introduction of Microcontroller	01	01	01	03	–	–	–	–	04
5	Networking Technology	–	–	03	09	02	08	–	–	17
	Total	04	04	12	36	06	24	06	30	94

Q. 1 A) Select the correct alternative and rewrite the following :

(a) _____ is Non-maskable Interrupt. (1)

(i) TRAP (ii) RST 7.5 (iii) RST 6.5 (iv) RST 5.5

(b) _______ Cable is most sensitive to EMI. (1)

(i) STP (ii) UTP (iii) Co-axial (iv) Fiber Optic

(c) Micro-processor 8085 belongs to _______ Company. (1)

(i) Motorla (ii) Zilog (iii) Intel (iv) Toshiba

(d) _______ of the following instructions is branching instruction. (1)

(i) ADD r (ii) JMP addr (iii) CMP M (iv) CMA

Ans. : (a) i (b) ii (c) iii (d) ii

(B) Attempt any two of the following

(a) Explain functions of the following registers :

i) Instruction Register **(Pl. refer ch.1/ Q - 35(c))**

ii) Instruction Decoder **(Pl. refer ch.1/ Q - 35(c))**

iii) Temporary Register **(Pl. refer ch.1/ Q - 34(II))**

(b) Define the following : **(Pl. refer ch.1/ Q - 55)**

i) T- State ii) Machine Cycle iii) Instruction Cycle

(c) List flags in 8085 and explain how they can be set or reset. 3

(Pl. refer ch.1/ Q - 39)

Q. 2 (A) Answer any two of the following :

a) Explain in brief functions of the following registers in 8085 : 3

i) Program Counter **(Pl. refer ch.1/ Q. 35 (d))**

ii) Stack Pointer **(Pl. refer ch.1/ Q - 35(b))**

iii) Accumulator **(Pl. refer ch.1/ Q - 34 (1))**

b) Explain 'Dual Pipeline' and 'Branch prediction' features of Pentium. 3

(Pl. refer ch.3/ Q - 8)

c) Explain SIM Instruction of 8085 in detail. 3

(Pl. refer ch.2/ Appendix Gr. (V B) (8))

(B) Attempt any one of the following :

a) Explain in brief 'Token Passing' and 'Polling' access methods.

(Pl. refer ch.5/ Q - 34) 4

b) Draw block diagram of the Micro-processor 8085.

(Pl. refer ch.1/ Q - 29)

Q. 3 (A) Attempt any two of the following :

a) Describe the following instructions of 8085: 3

i) SPHL - **(Pl. refer ch.2/ Q - 8(a))**

ii) XTHL - **(Pl. refer ch.2/ Appendix Gr. (V) (5))**

iii) LXI rp - **(Pl. refer ch.2/ Appendix Gr. I (6))**

b) Write down the applications of Micro - controllers. 3

Pl. refer ch. 4 /Q. 10

c) Why Wireless Networks are essential ? Give its reasons. 3

(B) Attempt any one of the following :

a) The accumulator contains 05H and register B contains 08H.What will be the effect of 'SUB B' instruction on flags ? Explain it with diagram. 4

Pl. refer ch. 2 /Q. 35

b) Explain programming model of 16-bit version of X-86. 4

Pl. refer ch. 3 /Q.13

Q. 4 (A) Attempt any two of the following :

a) Describe functions of the following pins of 8085 : 3

i) X1, X2 ii) AD0 - AD7 iii) A8 -A15

Pl. refer ch. 1 /Q.17

b) What is 'MODEM' ? Explain Synchronous and Asynchronous Modem. 3

Pl. refer ch. 5/Q. 37 & 38

c) What is 'HUB' ? Give its types and explain.

Pl. refer ch. 5/Q. 39 **3**

(B) Attempt any one of the following :

a) What is Micro-controller ? Discuss Members of the Micro - controller 8051. **4**

Pl. refer ch. 4 / Q. 1 & Q. 7

b) Define the term ' Topology' Explain various topologies with diagram. **4**

Pl. refer ch. 5/Q. 23 & 29

Q. 5 Attempt any two of the following :

a) Write a program in assembly language to find greatest number among a contents of block of memory which starts from D001H, the lengthe of block is stored at D00H. Store the greatest number at the end of block. **5**

Ans : (Pl. refer/ ch.2 / Q - 88)

b) Write a program in assembly language to sum the series, stored from D001, length of series is at D000H. Store result from D100H.

Ans : Pl. refer/ ch.2 / Q - 89)

c) Write a program in assembly language to substract contents of memory location D001H from the contents of memory location D000H. Store absolute difference at D002H.

Ans : (Pl. refer/ ch.2 / Q - 90)

OR

Q. 5 Answer any two of the following :

a) Give appropriate comments to the following program : **5**

Ans : (Pl. refer/ ch.2 / Q - 91)

b) There is block of memory stored from D001H, the length of block is stored at memory location D000H. Write a program in assembly language to chek, whether contents of these of these blocks are in sequence (consecutive) or not. If contents of blocks are in sequence (consecutive) then memory location D100H should contain00H, else FFH. **5**

(Pl. refer/ ch.2 / Q - 92)

c) Trace the following program and show contents of the following by. filling blanks : **5**

Ans : (Pl. refer/ ch.2 / Q - 93)

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Oct. 2010

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	03	09	02	08	–	–	18
2	Instruction Set and Programming of 8085	01	01	05	15	–	–	06	30	46
3	Introduction to INTEL X-86 Family	–	–	–	–	01	04	–	–	04
4	Introduction of Microcontroller	01	01	01	03	01	04	–	–	08
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q.1 (A) Select correct alternatives and rewrite the following :

(a) In 8085 Microprocessor, serial data is outputted to the external device through____ pin. 1

(i) SID (ii) SOD (iii) S_0 (iv) S_1

(b) In case of 8051 Microcontroller Chip, there are ____ external interrupts. 1

(i) 3 (ii) 2 (iii) 4 (iv) 5

(c) In case of 8085 instruction set, CMA is an example of ____ instruction. 1

(i) Arithmetic (ii) Branching (iii) Logical (iv) Data Transfer

(d) _____ is the type of cable, which does not carry electrical signals. 1

(i) UTP (ii) Co-axial (iii) STP (iv) Fiber Optic

Ans : a) (iii) b) (ii) c) (iii) d) (iv)

(B) Answer any two of the following

(a) Draw neat simplified block diagram of CPU Architecture of Microcomputer. 3

Pl. refer chap.1, Que.5

(b) Explain with suitable examples the (i) Implied and (ii) Register Addressing Modes of 8085 Microprocessor. 3

Pl. refer chap.2, Que.2

(c) Explain in brief the following characteristics of Transmission Media: 3

(i) Band Width **Pl. refer chap.5, Que.4 (a)**

(ii) Cost of the Media **Pl. refer chap.5, Que. 5 (i)**

(iii) Electromagnetic Interference **Pl. refer chap.5, Que.4 (d)**

Q. 2 **(A) Answer any two of the following :**

(a) Explain function of ALU with a simple block diagram.

Pl. refer chap.1, Que.30

(b) Explain the following instructions of 8085 Microprocessor with examples : 3

(Pl. refer chap 2. Appendix)

(i) SUI Data **Group II (9)**

(ii) XRA M **Group III (8)**

(iii) LHLD Addr **Group I (9)**

(c) Explain Co-axial Cable with a suitable figure.

Pl. refer chap.5, Que.8

(B) Answer any one of the following :

(a) Explain the following features of Pentium Processor : 4

(i) Dual Pipelining (ii) Branch Prediction

(iii) On Chip Changes (iv) 64 Bit Data Bus

Pl. refer chap.3, Que.8

(b) Explain in brief the functions of the following units of 8085 Microprocessor: 4

(i) Stack Pointer (ii) General Purpose Registers

(iii) Program Counter (iv) Instruction Register and Decoder

Pl. refer chap.1, Que.34 & Que. 35

Q. 3 **(A) Answer any two of the following :**

(a) Describe in brief the functions of the following Pins of 8085 Microprocessor : 3

(i) S_0 (ii) S_1

Pl. refer chap.1, Que.11(3)

(iii) $IO/\overline{M}$ to decide various operations **(Pl. refer Que.15(1)**

(b) The accumulator of 8085 Microprocessor contains data F2H What will be its contents, after the execution of the following instructions independently? 3

Pl. refer chap.2, Que.29 & make necessary changes.

(i) XRI 3BH ii) RAL (iii) SUI AE H

Ans: [A] = C9H [A]= E5H [A] = 44H

(c) Compare atleast three characteristics of Twisted Pair Cable and Co-axial Cable. 3

Pl. refer chap.5, Que.17

(B) Answer any one of the following :

(a) Explain hardware interrupts of 8085 Microprocessor with their priorities and vector addresses. 4

Pl. refer chap.1, Que.26

(b) Draw a neat block diagram of 8051 Microcontroller. 4

Pl. refer chap.4, Que.4

Q. 4 (A) Answer any two of the following :

(a) Explain the following instructions of 8085 Microprocessor with suitable examples 3

(i) SPHL (ii) PCHL

Pl. refer chap.2, Que.8

(b) In case of 8085 microprocessor, explain unconditional branching and conditional branching instructions with suitable examples. 3

Pl. refer chap.2, Que.10

(c) What is a Microcontroller? State any four advantages of Microcontrollor over Microprocessor.

Pl. refer chap.4, Que.2 3

(B) Answer any one of the following:

(a) Explain BUS Topology with necessary diagram and state its advantages. 4

Pl. refer chap.5, Que.23

(b) Explain the following devices : 4

(i) Modem (ii) Repeater

Pl. refer chap.5, Que.37 , Pl. refer chap.5, Que.39 (II)

Q. 5 Answer any two of the following :

(a) A series of numbers are stored in memory locations from C001H to C008H. Write a program in assembly language to find largest number among these numbers. Store largest number in memory location C009H. 5

Ans: (Pl. refer Ch.2 Q.94)

(b) Write an assembly language program to count number of times the data A4H is found in a block of memory locations starting from 4000H. Length of block is stored in location 3FFFH. Store result in -location 5000H. 5

Ans: (Pl. refer Ch.2 Q.95)

(c) Write an assembly language program to fill memory locations 3000H to 30FFH with the hexadecimal numbers 00H to FFH respectively. 5

Ans: (Pl. refer Ch.2 Q.96)

OR

Q. 5 Answer any two of the following :

(a) Write an assembly language program to copy a block of data having starting address 7900H to the new location 9100H. The length of block is stored at memory location 78FFH. 5

Ans: (Pl. refer Ch.2 Q.97)

(b) A block of data is stored in memory locations from D001 H The length of block is stored in memory location D00H. Write a program in assembly language that searches for first occurrence of data 11 H in given block. Store address of this occurrence in H-L pair. If the number is not found, then H-L. pair should contain 0000H. 5

Ans: **(Pl. refer Ch.2 Q.98)**

(c) A Hex number is stored at location C000H. Write an assembly language program to interchange its digit. The new number is to be stored at C001H. Add original number with new number and store result at location C010H. 5

Ans: **(Pl. refer Ch.2 Q.99)**

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March 2011

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	–	–	03	09	02	08	–	–	17
2	Instruction Set and Programming of 8085	02	02	04	12	–	–	06	30	44
3	Introduction to INTEL X-86 Family	–	–	–	–	01	04	–	–	04
4	Introduction of Microcontroller	01	01	02	06	01	04	–	–	11
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1 **(A) Select correct alternative and rewrite the following :**

(a) Bus Topologies are best suited for networks that use ________ Access Methods. 1

(i) Contention Based (ii) Token Passing

(iii) Polling (iv) None of these

(b) In 8051, 22 special function registers occupy memory space from ________ 1

(i) 08H to F8H (ii) 80H to F8H (iii) 80 to 8FH (iv) None of those

(c) During PUSH instruction of 8085, the stack pointer ________ 1

(i) Increment by 1 (ii) Increment by 2

(iii) Decrement by 1 (iv) Decrement by 2

(d) PSW is a combination of _______ registers. 1

(i) M and F (ii) H and F (iii) L and F (iv) A and F

Ans : a) (i) b) (ii) c) (iv) d) (iv)

(B) Answer any two of the following:

(a) Explain function of the following Pin in 8085 Microprocessor : 3

(i) HOLD **Pl. refer Chap 1, que. 10 (a)**

(ii) READY **Pl. refer Chap 1, que. 11 (1)**

(iii) INTA **Pl. refer Chap 1, que. 16 (2)**

(b) State RAM and ROM size of the following Microcontrollers 8048, 8049 8050. 3

Pl. refer Chap 4, que. 7

(c) Explain the following instructions of 8085 Microprocessor: 3

Pl. refer Chap 2 (Appendix)

(i) NOP **Group V (B) (6)**

(ii) XRA Reg. **Group III (7)**

(iii) LHLD Addr. **Group I (9)**

Q. 2 (A) Answer any two of the following :

(a) Explain the following Registers of 8085 Microprocessor : 3

(i) Stack Pointer

(ii) Program Counter

(iii) Instruction Register **Pl. refer Chap 1, que. 35**

(b) What is Protocol? Explain TCP/IP. **Pl. refer Chap 5, que. 36** 3

(c) What are the different ways of clearing Accumulator (A = 00H) in single instruction ? 3

Ans : (i) MVI A, 00H (ii) SUB A

(iii) XRA A (iv) ANI 00H

Q. 2 (B) Attempt any one of the following :

(a) Define the following terms with suitable diagram : 4

(i) T - State (ii) Machine Cycle (iii) Instruction Cycle

Pl. refer Chap 1, que. 55

(b) Explain main features of a Pentium Processor. 4

Pl. refer Chap 3, que. 3 (V)

Q. 3 (A) Answer any two of the following :

(a) Compare between UTP and Fiber Optic Cable. 3

Pl. refer Chap 5, que. 15

(b) Explain ALU of 'Generic Microprocessor. 3

Pl. refer Chap 1, que. 30

(c) Differentiate between Microcontrollers 8051 and 8052. 3

Pl. refer Chap 4, que. 8

(B) Answer any one from the following :

(a) State any eight features of Microcontroller 8051. 4

Pl. refer Chap 4, que. 3

(b) Explain Flag Register of 8085 Microprocessor with example. 4

Pl. refer Chap 1, que. 39 & 42

Q. 4 (A) Answer any two of the following :

(a) Differentiate between LAN and WAN. 3

Pl. refer Chap 5, que. 7

(b) Explain any three addressing modes of 8085 Microprocessor with example. 3

Pl. refer Chap 2, que. 2

(c) If Accumulator contains data ABH and C register contains EFH, what will be the contents of accumulator after execution of the following instructions ?

(i) ADD C (ii) SUB C (iii) ORA C

Ans : [A] = 94 H [A] = BCH [A] = EOH

Pl. refer ch. 2 Q. 19 & Q. 21 (1) and Make necessary changes.

(B) Answer any one of the following :

(a) What is Topology ? Explain BUS and STAR Topologies. 4

Pl. refer Chap 5, que. 23 & Q.25

(b) Write functions of each of the following devices in short: 4

(i) Modem (ii) HUB (iii) Router (iv) Repeater

Pl. refer Chap 5, que. 41

Q. 5 Answer any two of the following :

(a) Write an Assembly Language Program to add all odd numbers stored in memory block of 10 locations starting from 2000H. Store two byte sum at memory location starting from 3000H.

Ans: Pl. refer Chap 2, que. 51 5

(b) Write an Assembly Language Program to separate nibbles of a number stored at memory location 2000H. Multiply separated nibbles and store result. 5

Ans: (Pl. refer Ch.2 Q.100)

(c) Write ______ a program in Assembly Language. to transfer a block of data from 1050 to 1059 to memory location whose starting address is 1070H. 5

Ans: (Pl. refer Ch.2 Q.101)

OR

Q. 5 (A) Answer any two of the following :

(a) Write an Assembly Language Program to count number of even data bytes occurring in a block starting from memory location C030H to C039H. 5

Store result at the memory location C040H.

Ans: (Pl. refer Ch.2 Q.102)

(b) Write an Assembly Language Program to exchange position of digit of number stored at C040H. Multiply original number with the exchanged number, the result to be stored at memory location starting from C041H onwards. 5

Ans : (Pl. refer Ch.2 Q.103)

(c) Write an Assembly Language program to add two 16 bit numbers. The numbers are stored at memory location C030H and C031H, and the second number stored at C032H and C033H. Store result at memory location C034H and C035H. Store final carry at C036H. 5

Ans : (Pl. refer Ch.2 Q.104)

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Oct. 2011

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	–	–	04	12	02	08	–	–	20
2	Instruction Set and Programming of 8085	02	02	03	09	–	–	06	30	41
3	Introduction to INTEL X-86 Family	–	–	01	03	01	04	–	–	07
4	Introduction of Microcontroller	01	01	01	03	01	04	–	–	08
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1 (A) Select the correct alternatives and rewrite the following:

a) The instruction CMA is _______ Byte function. 1

(i) 1 byte (ii) 2 byte (iii) 3 byte (iv) 4 byte

b) ______ instruction is Logical Instruction. 1

(i) ADD r (ii) MVI r, data (iii) ANI, data (iv) LX1 rp, data

c) Micro-controller 8051 have ______ .External Interrupts. 1

(i) 1 (ii) 2 (iii) 3 (iv) 4

d) ________ Cable uses light signals to transmit the data. 1

(i) Co-axial (ii) Fiber Optic (iii) STP (iv) UTP

Ans.:	a) (i)	b) (iii)	c) (ii)	d) (ii)

(B) Answer any two of the following :

a) Write down the functions of Accumulator. 3

Ans.: Please refer Chapter 1, Question 34

b) What is Sub-routine ? Give its related instructions in 8085. 3

Ans.: Please refer Chapter 2, Question 11

c) What is Interrupt ? List them according to order of priority, also mention maskable and non-maskable from these. 3

Ans.: Please refer Chapter 1, Question 21 and 22

Q. 2 (A) Answer any two of the following :

a) Write down the Primary Functions of Micro-processor. 3

Ans.: Please refer Chapter 1, Question 1

b) Give the functions of following pins : 3

(i) HOLD **Ans.: Please refer Chapter 1, Question 10**

(ii) CLK (OUT) **Ans.: Please refer Chapter 1, Question .16**

(iii) $IO/\overline{M}$ **Ans.: Please refer Chapter 1, Question 15**

c) What is Addressing Mode ?. Identify the addressing mode of following instructions :

(i) MVI A, 05H (ii) MOV A, B

(iii) CMA (iv) STAX B 3

Ans. : Addressing mode is the various format of specifying operands.

(i) MVI A, 05 H — Immediate addressing mode

(ii) MOV A, B — Register addressing mode

(iii) CMA — Implicit/Implied addressing mode

(iv) STAXB — Register Indirect addressing mode

(B) Answer any one of the following :

a) What is Flag ? Explain Flag in 8085 with diagram. 4

Ans.: Please refer Chapter 1, Question 39

b) Draw the pin diagram of Micro-processor 8085. 4

Ans.: Please refer Chapter 1, Question 8

Q. 3 (A) Answer any two of the following :

a) Explain the following instructions 3

(i) LDA addr **Ans.: Please refer Chapter 2, Appendix (I)(7)**

(ii) LHLD addr **Ans.: Please refer Chapter 2, Appendix Gr. (I)(9)**

(iii) XRI data **Ans.: Please refer Chapter 2, Appendix Gr. (III)(9)**

b) Compare 80486 and 80586. 3

Ans.: Please refer Chapter 3, Question 4

c) Write short note on Micro-controller 8051 Family. 3

Ans.: Please refer Chapter 4, Question 7

(B) Answer any one of the following

a) Explain X-86 Flag Register with diagram. 4

Ans.: Please refer Chapter 3, Question 15

b) List the features of Micro-controller 8051. 4

Ans.: Please refer Chapter 4, Question 3

Q. 4 (A) Answer any two of the following

a) Draw the diagram of Fiber optic Cable and explain. 3

Ans.: Please refer Chapter 5, Question 14

b) Explain the following characteristics of Transmission Media : 3

(i) Attenuation (ii) EMI (iii) Band Width

Ans.: Please refer Chapter 5, Question 4

c) Explain 'Router' in detail. 3

Ans.: Please refer Chapter 5, Question 40

(B) Attempt any one of the following

a) Write short notes : 4

(i) Microwave Transmission (ii) Radiowave Transmission

Ans.: Please refer Chapter 5, Question 20

b) What is meant by Access Method ? Explain any two Access methods. 4

Ans.: Please refer Chapter 5, Question 34

Q. 5 Answer any two of the following :

a) Write a program in assembly language to find the position of a data 05H in a block of memory D001H to D005H. If data is found then store the position of data at memory location D100H else store 00H at the same memory location. 5

(Note : It is assumed that data 05 may present only at once.)

Ans.: Please refer Chapter 2, Question 105

b) Write a program is assembly language to double the contents of block of memory from D0O1H to DOOAH. Store the doubled contents at same memory locations. 5

(**Note :** It is assumed that contents are not exceeding OFH.)

Ans.: **Please refer Chapter 2, Question 106**

c) Write a program to exchange the two nibbles, stored at 2500H. Store the exchanged it at number at 2501H. 5

Ans.: **Please refer Chapter 2, Question 107**

OR

Q. 5 Attempt any two of the following :

a) Write a assembly language program to copy the contents of a block of memory which is from 2501H to 2505H, to another block begins from 3501H. 5

Ans.: **Please refer Chapter 2, Question 108**

b) There are two blocks of memory, one is from 2,501H to 2505H. Another is from 3501H to 3505H. Write a program in assembly language to check weather, contents of these two blocks are exactly same or not.

If contents are same then memory location D100H should contain OOH else FFH. 5

Ans.: **Please refer Chapter 2, Question 109**

-) Write a program in assembly language to rotate the content of memory location D000H toward left by one bit position and add original contents with rotated number and store the result from DOO1H. 5

ns.: **Please refer Chapter 2, Question 110**

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March 2012

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	03	09	02	08	–	–	18
2	Instruction Set and Programming of 8085	01	01	05	15	–	–	06	30	46
3	Introduction to INTEL X-86 Family	–	–	–	–	01	04	–	–	04
4	Introduction of Microcontroller	01	01	01	03	01	04	–	–	08
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1 (A) Select the correct alternatives and rewrite the following:

a) In 8085 Microprocessor, _________ pin is the only output terminal interrupt control block. **1**

(i) TRAP (ii) IN IR (iii) RST 7.5 (iv) $\overline{\text{INTA}}$

b) _______ is a characteristic feature of 8051 Micro-controller. **1**

(i) Four 8 bit I/O Ports (ii) Two 8 bit I/O Ports
(iii) 4kB RAM (iv) Four External Interrupts

c) The instruction JNZ of 8085 microprocessor is _______ type of instruction. **1**

(i) Branching (ii) Conditional Branching
(iii) Arithmetic (iv) Data Transfer

d) The Installation Cost of _______ cable is maximum. **1**

(i) STP (ii) UTP (iii) Fiber Optic (iv) Co-axial

Ans.:	a) (iv)	b) (i)	c) (ii)	d) (iii)

(B) Answer any two of the following :

a) Explain any three primary functions of the CPU of a Micro-computer. **3**

Ans.: Please refer Chapter 1, Question 4

b) Explain with suitable examples the (i) Register Indirect and (ii) Implied Addressing Modes of 8085 Microprocessor. **3**

Ans.: Please refer Chapter 2, Question 2

c) Explain in brief the six important characteristics of Transmission Media. **3**

Ans.: Please refer Chapter 5, Question 6

Q. 2 (A) Answer any two of the following :

a) In case of a Microprocessor Architecture, explain the following terms in brief : **3**

(i) Address Bus (ii) Data Bus
(iii) Control Bus

Ans.: Please refer Chapter 1, Question 6

b) Explain the following instructions of 8085 Microprocessor with suitable examples : **3**

(i) SBB M **Ans.: Please refer Chapter 2, Appendix Group (II)(11)**

(ii) CPI Data **Ans.: Please refer Chapter 2,Appendix Group (III)(12)**

(iii) XTHL **Ans.: Please refer Chapter 2, Appendix Group (V)(A)(5)**

c) Explain Fibre Optic Cable with a suitable figure. **3**

Ans.: Please refer Chapter 5, Question 14

(B) Answer any one of the following :

a) Compare any four attributes of 486 DX with Pentium Processor. **4**

Ans.: Please refer Chapter 3, Question 5

b) Explain use of extended register pairs BC and HL of 8085 Microprocessor as Pointers with the help of suitable examples. **4**

Ans.: **Please refer Chapter 1, Question 40**

Q. 3 **(A) Answer any two of the following :**

a) Describe in brief the function of the following pins of 8085 Microprocessor : **3**

(i) $\overline{RD}$ **Ans.: Please refer Chapter 1, Question 9**

(ii) $\overline{WR}$ **Ans.: Please refer Chapter 1, Question 9**

(iii) ALE **Ans.: Please refer Chapter 1, Question 9**

b) The accumulator of 8085 contains data B7h. What will be its contents after execution of the following instructions independently ?

(i) ORI 58 H (ii) CMA (iii) ANI E3 H

Ans.: **Please refer Chapter 2, Question 38**

c) Compare at least three characteristics of UTP and STP Cables. **3**

Ans.: **Please refer Chapter 5, Question 13**

B) **Answer any one of the following :**

a) What are Vectored Interrupts ? What are Maskable and Non-maskable Interrupts ? State all Hardware Interrupts of 8085 Microprocessor with their priorities and branching or vector addresses. **4**

Ans.: **Please refer Chapter 1, Question 28**

b) Give any eight important features of 8051 Microcontroller. **4**

Ans.: **Please refer Chapter 4, Question 3**

Q. 4 **(A) Answer any two of the following :**

a) Explain the following instructions of 8085 Microprocessor with suitable example : **3**

(i) DAA **Ans.: Please refer Chapter 2, Appendix Group (II)(19)**

(ii) DAD **Ans.: Please refer Chapter 2, Appendix Group (II)(20)**

b) Explain Stack Operation in case of 8085 Microprocessor with the help of suitable instructions like PUSH and POP. **3**

Ans. :

PUSH - **Ans.: Please refer Chapter 2, Appendix Group (V)(1)**

Only comments and example of PUSH instruction.

POP - **Ans.: Please refer Chapter 2, Appendix Group (V)(3)**

Only comments and example of POP instruction.

c) Compare 8052 Microcontroller with 8051 Microcontroller. **4**

Ans.: **Please refer Chapter 4, Question 8**

(B) Answer any one of the following :

a) Explain STAR Topology with necessary diagram. State its advantages. 4

Ans.: Please refer Chapter 5, Question 25

b) Explain the following devices used in Computer Networking : 4

(i) Modem **Ans.: Please refer Chapter 5, Question 37**

(ii) Repeater **Ans.: Please refer Chapter 5, Question 39**

Q. 5 Answer any two of the following :

a) An 8 it number is stored in memory location 4400H. Write an assembly language program to count 'Zero' in the given. number. Store count in memory location 4500H. 5

Ans.: Please refer Chapter 2, Question 111

b) A series of numbers are stored in memory locations from COO1H to C008 H. Write a program in assembly language to find smallest number among these numbers. Store smallest number in memory location COO9H. 5

Ans.: Please refer Chapter 2, Question 112

c) Write an assembly language program to counter number of odd data byte occurring in a block starting from memory location AOO1H to AOFFH. Store result at memory location B000H. 5

Ans.: Please refer Chapter 2, Question 113

OR

Q. 5 Answer any two of the following:

a) Hex number is stored at location ABOOH. Write an assembly language program to interchange its digit. The new number is to be stored at ABO1H. Add original number with new number and store result at location ABCDH. 5

Ans.: Please refer Chapter 2, Question 114

b) Write an assembly language program to add two BCD numbers stored at locations. AB00H and AB01H. Place BCD result in location ABO2H and onwards starting with LSB. 5

Ans.: Please refer Chapter 2, Question 115

c) Write a program in assembly language to find 2's Complement of 8 bit number stored in memory location C000H. Store result at memory location. C001H. 5

Ans.: Please refer Chapter 2, Question 116

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Oct. 2012

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	02	06	02	08	–	–	15
2	Instruction Set and Programming of 8085	01	01	05	15	–	–	06	30	46
3	Introduction to INTEL X-86 Family	–	–	–	–	01	04	–	–	04
4	Introduction of Microcontroller	01	01	02	06	01	04	–	–	11
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1 (A) Select correct alternative and rewrite the following statements

(a) A ______ is a set of rules governing the Share of Transmission Medium network. 1

(i) Frames (ii) Protocol (iii) Assess Method (iv) Topology

b) Micro-controller 8052 has _______ external interrupts. 1

(i) 2 (ii) 3 (iii) 4 (iv) 5

c) ________ Flag is always reset in ANA instruction. 1

(i) Carry (ii) Parity (iii) Sign (iv) Zero

d) ________ pin of Micro-processor 8085 is never tr. Stated. 1

(i) SOD (ii) READY (iii) ALE (iv) HOLD

Ans. : (a) (ii) (b) (ii) (c) (i) (d) (iii)

(B) Answer any two of the following :

(a) Define Micro-controller. State any four features of 8051 Micro-controller. 3

Ans. : Please refer chapter 4, Q. 3.

(b) Explain following instruction of 8085 : 3

(i) CPI 8-bit (ii) RAL (iii) DAD rp

Ans. : Please refer chapter 2 Appendix.

(c) Explain various operations performed by the status signals S_0 and S_1, IO/M. 3

Ans. : Please refer chapter 1, Q. 11 & 15.

Q. 2 (A) Answer any two of the following :

(a) Explain Ring Topology. Give its one advantage and disadvantage. 3

Ans. : Please refer chapter 5, Q. 24.

(b) Explain PCHL Instruction of micro-processor 8085 and justify the statement that it is equivalent to 3 byte unconditional jump instruction. 3

Ans. : For only Explanation of PHCL Please refer chapter 2 Q. 8(b) and Q. 9 for other.

(c) State the number of bytes using and addressing modes of the following instruction of 8085 Micro-processor: 3

(i) LXI (ii) STAX (iii) IN

Ans. .: Please refer chapter 2 Appendix.

(B) Answer any one of the following:

(a) Draw a labeled functional block diagram of micro-processor 8085. 4

Ans.: Refer ch-1 , Q.29

(b) Compare any four attributes of 80386 & Pentium processor. 4

Ans.: Refer ch-3 , Q.6

Q. 3 (A) Answer any two of the following :

(a) Explain following Pins of 8085 Micro-processor 3

(i) CLK (out) (ii) $\overline{WR}$ (iii) RST 5.5

Ans. : Please refer chapter 1 Q. 16 & Q. 9 and Q. 12.

(b) Compare any three characteristics of Twisted Pair and Co-axial Cable. 3

Ans. : Please refer Chapter 5, Q. 17.

(c) List any three Micro-controllers of 8051 family and state one feature of each (other than 8051). 3

Ans. : Please refer chapter 4, Q. 7)

(B) Answer any one of the following :

(a) Differentiate between Maskable and Nori-maskable Interrupts. 4

Ans. : Please refer chapter 1, Q. 27.

(b) State any four advantages and four applications of Micro-controller 8051. 4

Ans. : Please refer chapter 4, Q. 2 and Q. 10.

Q. 4 (A) Answer any two of the following :

(a) Explain following instruction of 8085 Micro-processor : 3

(i) SHLD (ii) ORI (iii) SBB #

Ans. : Please refer chapter 2, Appendix.

(b) Write a short note of Fiber Optic Cable with neat diagram. 3

Ans. : Please refer chapter 5, Q. 14,.

(c) Explain the following instruction of 8085 : 3

(i) RLC (ii) RAR with example

Ans. Please refer chapter 2, Appendix.

(B) Answer any one of the following :

(a) What is Transmission Media ? Explain the following characteristics of Transmission Media : 4

(i) Bandwidth (ii) Attenuation (iii) EMI

Ans. : Please refer chapter 5, Q. 1 and Q. 4.

(b) Explain in detail the following connectivity devices : 4

(i) MODEM (ii) HUB

Ans. : Please refer chapter 5, Q. 37 and Q. 39.

Q. 5 Answer any two of the following:

(a) Write an ALP to subtract the number stored in memory location 3601H form the number stored in memory location 3600H. Store the positive result at location 3602H. 5

Ans. : Please refer chapter 2, Q. 2.

(b) Write an Assembly Language Program to generate the Fibonacci series for first eight number. Store the series in a memory block starting from C100H. 5

[**Note :** The first eight numbers of series are 00, 01, 01, 02, 03, 05, 08, 0D]

Ans. : Please refer chapter 2, Q. 28.

(c) Write an Assembly Language Program to multiply the given BCD data at location C050H and C051F1. Store the result in C060H and C061H respectively. 5

Ans. : Please refer chapter 2, Q. 117.

OR

Q. 5 Answer any two of the following :

(a) Write a program in assembly language that converts a BCD number stored at C030H to its Hexadecimal Equivalent. Store the hexadecimal result in C031H. 5

Ans. : Please refer chapter 2, Q. 118.

(b) Write an ALP to count number of even data byte occurring in a block stored from memory location 3001H and onwards the length of block is stored in location 3000H store the result in 3100H. 5

Ans. : Please refer chapter 2, Q. 12.

(c) Write an Assembly Language Program that multiplies the original number. Stored at C030H with its lower nibble. Store the result starting from C031 H onwards. 5

Ans. : Please refer chapter 2, Q. 119.

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March 2013

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	04	12	01	04	–	–	17
2	Instruction Set and Programming of 8085	01	01	04	12	01	04	06	30	47
3	Introduction to INTEL X-86 Family	–	–	–	–	02	08	–	–	08
4	Introduction of Microcontroller	01	01	01	03	–	–	–	–	04
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1 **(A) Select correct alternatives and rewrite the following :**

(a) ALU is _______ bit unit in 8085 Microprocessor.

(i) 8 (ii) 16 (iii) 32 (iv) 64

(b) The flag bit that gets affected on execution of RCC instruction in 8085 Processor is _______. 1

(i) Zero (ii) Parity (iii) Carry (iv) All

(c) ______ is Microcontroller chip. 1

(i) 8085 (ii) 8086 (iii) 8051 (iv) Pentium

(d) _______ cable type is ideal for connecting between two buildings. 1

(i) UTP (ii) STP (iii) Co-axial (iv) Flat

Ans. : (a) (i) (b) (iii) (c) (iii) (d) (iii)

(B) **Answer any two of the following :**

(a) Write a short note on Interrupts in 8085 Microprocessor. 3

Ans. : **Please refer Chapter 1, Q. 21, P. No. 1-14.**

(b) Explain any three addressing modes of 8085 Microprocessor with an example of each. 3

Ans. : **Please refer Chapter 2, Q. 2.**

(c) Explain various applications of Microcontroller. 3

Ans.: **Please refer Chapter 4, Q. 10.**

Q. 2 **(A) Answer any two of the following :**

(a) Explain functions of following registers of 8085 Microprocessor : 3

(i) Accumulator (ii) Flag (iii) Program Counter

Ans. Please refer Chapter 1 Q. 34(I), Q. 39 & Q. 35.

(b) Explain the following instruction of 8085 Microprocessor with suitable example of each : 3

(i) XTHL (ii) DAD rP

Ans. : Please refer Chapter 2 Appendix V(5) & Appendix II (19).

(c) Explain the following characteristics of transmission media : 3

(i) Bandwidth (ii) Band Usage (iii) Attenuation.

Ans. : Please refer Chapter 5, Q. 4.

(B) Answer any one of the following :

(a) Draw Block diagram of 8085 Microprocessor. 4

Ans. : Please refer Chapter 1, Q. 29.

(b) Compare any four attributes of UTP and Optical Fiber Cable. 4

Ans. : Please refer Chapter 5, Q. 15.

Q. 3 **(A) Answer any two of the following :**

(a) The flag register of 8085 Microprocessor contains the data AAH, Interpret its meaning. 3

Ans. : Please refer Chapter 1, Q. 51.

(b) Describe in brief the functions of the following pins of 8085 Microprocessor t,

(i) IO/M (ii) SID

(iii) HLDA

Ans. : (i) Please refer Chapter 1, Q. 15(a)

(ii) Please refer Chapter 1, Q. 13(i).

(iii) Please refer Chapter 1, Q. 11(4).

(c) Define Bus, Ring and Star Topologies. Draw simple diagram for each. 3

Ans. : Please refer Chapter 5, Q. 29.

Note : For diagram of Bus, Ring, and star topology refer chapter 5, Q. 23, 24 and 25 respectively.

(B) Answer any one of the following :

(a) Explain the following instruction with diagram :

(i) RLC (ii) RRC (iii) RAL (iv) RAR

Ans. : (i) RLC : Please refer chapter 2, Appendix III, 13.

(ii) RRC : Please refer chapter 2, Appendix III, 14.

(iii) **RAL : Please refer chapter 2, Appendix III, 15.**

(iv) **RAR : Please refer chapter 2, Appendix III, 16.**

(b) Compare any four attributes of 80286 and 80486 Processors. 4

Ans. : Please refer Chapter 3, Q. 10.

Q. 4 (A) Answer any two of the following

(a) The accumulator of 8085 processor contains data B8H and register B contains 44 H. What will be the content of accumulator after execution of each of the following instruction independently ? 3

(i) ORI F0H (ii) ANA B

(iii) XRI 0FH

Ans. : Please refer Chapter 2, Q. 22.

(b) Explain the following instruction of 8085 Microprocessor with suitable example of each : 3

(i) STA add r (ii) ADD r (iii) CMP r

Ans. :

(i) STA add r : Please refer Chapter 2, Appendix I, 8.

(ii) ADD r : Please refer Chapter 2, Appendix It. 1.

(iii) CMP r : Please refer Chapter 2, Appendix III, 10.

(c) Explain Hub and Repeater in detail.

Ans. : Please refer Chapter 5, Q.39.

(B) Answer any one of the following :

(a) Explain advantages of the following features of the Pentium Processor : 4

(i) Dual Pipelining (ii) On Chip Caches

(iii) Brach Prediction (iv) 64-bit Data Bus

Ans. : Please refer Chapter 3, Q.8.

(b) What is meant by Protocol ? Explain Concept of TCP/IP Protocol. 4

Ans. : Please refer Chapter 5, Q.36.

Q. 5 Answer any two of the following :

(a) Write assembly language program to count number of even data bytes occurring in a block stored from memory location C0511-1 and onwards. The length of block is stored in location C050H. Store result in location. C060H. 5

Ans. : Please refer Chapter 2, Q. 120.

(b) Write an assembly language program to perform multiplication of two 8-bit numbers where multiplicand is stored at the memory locations C051H and C052H and multiple is stored at C053H. The result is to be stored at memory location address C054H to C055H. 5

(Note : 8-bit multiplicand is extend to 16-bit)

Ans. : Please refer Chapter 2, Q. 121.

(c) A hex number is stored at location 3000H. Write an assembly language program to interchange its digits. The new number is to be stored at 3001 H. Add original number with new number and store result at location 3010H. 5

Ans. : Please refer Chapter 2, Q. 13.

OR

Q. 5 (A) Answer any two of the following :

(a) Write assembly language program to count occurrence of the data. ABH in a memory block starting from 4000H to 400FH. Store count at memory location 4500H. 5

Ans. : Please refer Chapter 2, Q. 122.

(b) A block of data is stored in memory locations from 7500 H to 75FFH, Write an assembly language program to transfer block in reverse order to memory location 7600H and onwards. 5

Ans. : Please refer Chapter 2, Q. 123.

(c) Write an assembly language program to find largest element in block of data. The length is in memory location D000H and block begins in memory location D002H. Store maximum in D000H. Assume that all number are 8-bit unsigned binary numbers. 5

Ans. : Please refer Chapter 2, Q. 124.

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Oct. 2013

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	02	06	01	04	–	–	11
2	Instruction Set and Programming of 8085	01	01	05	15	01	04	06	30	50
3	Introduction to INTEL X-86 Family	–	–	–	–	01	04	–	–	04
4	Introduction of Microcontroller	01	01	02	06	01	04	–	–	11
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1 (A) Select the correct alternatives and rewrite the following:

(a) Micro-controller 8050 has ________ bytes of RAM 1

(i) 64 (ii) 128 (iii) 256 (iv) 32

(b) ________ flag is affected in CMA Instruction. 1

(i) All (ii) No (iii) Carry (iv) Zero

(c) Micro-processor T 8190 is a ________ bit Micro-processor. 1

(i) 4 (ii) 8 (iii) 12 (iv) 16

(d) ________ is a set of rules and formats for sending and receiving data in a network. 1

(i) Interface (ii) Frames (iii) Protocols (iv) Access Method

Ans. :	(a) (iii)	(b) (ii)	(c) (iii)	(d) (iii)

(B) Answer any two of the following :

(a) Explain function of 8085 Micro-processor pins : 3

(i) Resetout (ii) ALE (iii) TRAP

Ans. :

(i) Please refer Chapter 1 Q. 16(1).

(ii) Please refer Chapter 1 Q. 9.

(iii) Please refer Chapter 1 Q. 15.

(b) Explain the following 8085 Instruction : 3

(i) XTHL (ii) DAA

Ans. :

(i) Please refer Chapter 2 Appendix.

(ii) Please refer Chapter 2 Appendix.

(c) Define Micro-controllers and state its advantages over Micro-processor Based system. 3

Ans. : Please refer Chapter 4 Q. 2.

Q. 2 (A) Answer any two of the following :

(a) Write a short note on Evolution of Micro-processor giving one example of each generation. 3

Ans. : Please refer Chapter 1 Q. 2.

(b) Explain conditional and unconditional RET instruction of Micro-processor 8085. 3

Ans. : Please refer Chapter 2 Appendix.

(c) Differentiate between UTP and STP cable. 3

Ans. : Please refer Chapter 5 Q. 13.

(B) Answer any one of the following :

(a) Differentiate DAD and ADD Instruction of 8085 Micro-Processor 4

Ans. : Please refer Chapter 2, Q. 36.

(b) Draw and explain Programming Model of 32-bit Version of -86 Family. 4

Ans. : Please refer Chapter 3 Q. 12.

Q. 3 (A) Answer any two of the following :

(a) State any there features and applications of 8051 Micro-controller. 3

Ans. : Please refer Chapter 4 Q. 3 and Q. 10.

(b) Define Addressing Mode of 8050 and explain any two of them with example. 3

Ans. : Please refer Chapter 2 Q. 2.

(c) Explain concept of the TCP/IP Protocol. 3

Ans. : Please refer Chapter 5 Q. 36.

(B) Answer any one of the following :

(a) What is Interrupt ? Differentiate between Hardware and software Interrupt. 4

Ans. : Please refer Chapter 1 Q. 21 & 24.

(b) Explain Memory Map of 8051. 4

Ans. : Please refer Chapter 4 Q. 5.

Q. 4 (A) Answer any two of the following :

(a) Differentiate between PUSH and POP. 3

Ans. : Please refer Chapter 2, Q. 37.

(b) If Accumulator Contains the Data 23H and B Register Contains 35H. What will be the contents of Accumulator. After execution of each of the following instruction independently : 3

(i) XRA (ii) ANI FOH (iii) CPI OAH

Ans. : Please refer Chapter 2, Q. 23.

(c) Explain the following Wireless Media in detail : 3

(i) Microwave (ii) Infrared

Ans. : Please refer Chapter 5 Q. 20.

(B) Answer any one of the following :

(a) Define Access Method. Explain contension Access Method and Token Passing Assess Method. 4

Ans. : Please refer Chapter 5 Q. 34.

(b) Explain Modem and HUB in detail. 4

Ans. : Please refer Chapter 5 Q. 37 and Q. 39.

Q. 5 Answer any two of the following :

(a) Write an Assembly Language Program to Count the Number of times data 7EH is found in a block of memory location starting from 3000H. Length of block is stored in location 2FFFH. Store the result in location 2000H. 5

Ans. : Please refer Chapter 2, Q. 125.

(b) Write a program in Assembly Language that multiply two 8-bit numbers stored in memory location D000H and D001H. Store the two byte result in consecutive memory locations starting from D002H. 5

Ans. : Please refer Chapter 2, Q. 126.

(c) Write a program in Assembly Language that converts a hexadecimal numbers stored at C030H to its BCD equivalent. Store the BCD result in C031H onwards (AFH = 0175 BCD). 5

Ans. : Please refer Chapter 2, Q. 118.

OR

Q. 5 Answer any two of the following :

(a) Write an Assembly Language program that divides two one byte hex numbers where dividend is stored in memory location C000H and divisor is stored in memory location C001H. store quotient and reminder in memory location C002H and C003H respectively. 5

Ans. : Please refer Chapter 2, Q. 127.

(b) Write an ALP to calculate Sum of Series of Number. The length of the series is in memory location C100H and Series itself begins in memory location C101H. Assume Sum to be an 8-bit No. Store Result in C204H. 5

Ans. : Please refer Chapter 2, Q. 128.

(c) An Assembly Language Program to Find 2's Complement of five numbers stored from memory location C030H and onwards. Store the result from memory location D000H. 5

Ans. : Please refer Chapter 2, Q. 129.

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March 2014

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	04	12	02	08	–	–	21
2	Instruction Set and Programming of 8085	01	01	01	03	01	04	06	30	38
3	Introduction to INTEL X-86 Family	–	–	–	–	01	04	–	–	04
4	Introduction of Microcontroller	01	01	01	03	01	04	–	–	08
5	Networking Technology	01	01	06	18	01	04	–	–	23
	Total	04	04	12	36	06	24	06	30	94

Q. 1(A) Select correct option and rewrite the following :

(a) ___________ pin of 8085 MPU is multiplexed. 1

(i) IO/ $\bar{M}$ (ii) HOLD (iii) SID (iv) ALE

(b) LXI rp, $Data_{16}$ is __________ byte instruction. 1

(i) TWO (ii) ONE (iii) THREE (iv) FOUR

(c) Internal Data memory of 8051 microcontroller is ____________ . 1

(i) 128 bytes (ii) 128 k bytes (iii) 256 bytes (iv) 4 k bytes

(d) ________ cable has maximum EMI resistance. 1

(i) Thicknet (ii) Thinnet (iii) UTP (iv) Fiber optic

Ans. : (a) (i) (b) (iii) (c) (i) (d) (iv)

(B) Answer any two of the following :

(a) Explain following Flags of 8085 MPU : 3

(i) Parity Flag (ii) Carry Flag

(iii) Auxiliary Carry Flag

Ans. : Please refer chapter 1, Q. 39.

(b) What is a Microcontroller ? State any two advantages over MPU based system ? 3

Ans. : Please refer chapter 4, Q. 2.

(c) Explain Ring Topology with diagram. State its two advantages. 3

Ans. : Please refer chapter 5, Q. 24.

Q. 2(A) Answer any two of the following :

(a) Give functions of the following 8085 registers : 3

(i) PC (ii) SP (iii) IR

Ans. :

(i) PC : Please refer chapter 1, Q. 35.

(ii) SP : Please refer chapter 1, Q. 35.

(iii) IR : Please refer chapter 1, Q. 35.

(b) Explain Immediate and implied addressing modes of 8085 MPU. 3

Ans. : Please refer chapter 2, Q. 2.

(c) Explain any three characteristics of transmission media. 3

Ans. : Please refer chapter 5, Q. 4.

(B) Answer any one of the following :

(a) Draw and explain complete memory map of 8051 microcontroller. 4

Ans. : Please refer chapter 4, Q. 5.

(b) What is Protocol ? Explain TCP/IP protocol used in network. 4

Ans. : Please refer chapter 5, Q. 36.

Q. 3 (A) Answer any two of the following :

(a) What are Interrupts ? Explain Maskable and Non-Maskable interrupts of 8085 giving example of each. 3

Ans. : Please refer chapter 1, Q. 21 and Q. 27.

(b) What is MODEM ? Explain working of MODEM and specify types of MODEMs. 3

Ans. : Please refer chapter 5, Q. 37 and Q. 38.

(c) Explain UTP cable with its any four characteristics 3

Ans. : Please refer chapter 5, Q. 12.

(B) Answer any one of the following :

(a) Explain function of the following Pins of 8085 MPU : 4

(i) HOLD (ii) SID

(iii) READY (iv) $\overline{WR}$

Ans. :

(i) Please refer chapter 1, Q. 10.

(ii) Please refer Chapter 1, Q. 13(i).

(iii) Please refer chapter 1, Q. 11.

(iv) Please refer chapter 1, Q. 9.

(b) Draw programming models of X-86 16 bit and X-86 32 bit Microprocessor. 4

Ans. : Please refer chapter 3, Q. 12 and Q. 13.

Q. 4 (A) Solve any two of the following :

(a) Explain function of Register A of 8085 MPU. 3

Ans. : Please refer chapter 1, Q. 34.

(b) Give atleast two advantages and one disadvantage of wireless media over cable media. 3

Ans. : Please refer Chapter 5, Q. 43.

(c) List various network access methods and explain any one of them. 3

Ans. : Please refer chapter 5, Q. 34.

(B) Answer any one of the following :

(a) Accumulator contents are B8H and Register B contents are C9H. What are the contents of Accumulator and Flag register after execution of instructions ANA B, SUB B independently. 4

Ans. : Please refer Chapter 2, Q. 24.

(b) Explain all the Generations of Microprocessors and give example of each. 4

Ans. : Please refer chapter 1, Q. 2.

Q. 5 Answer any two of the following :

(a) Write ALP to store 00H in register B only if the contents memory location 201FH are odd. Otherwise store EEH in register B. 5

Ans. : Please refer Chapter 2, Q. 130.

(b) Write ALP to find largest element in a memory block from D000H to D00FH. Store largest number at memory location C500H. 5

Ans. : Please refer Chapter 2, Q. 131.

(c) Write. ALP to add all the BCD numbers in a block from 2001H To 2009H. Store SUM at memory location 2000AH. [Assume SUM is 8 bit] 5

Ans. : Please refer Chapter 2, Q. 132.

OR

Q. 5 Answer any two of the following :

(a) Write ALP to find SUM of a number and its reverse which is stored at memory location 2080H. Store SUM at 2081H 5

Ans. : Please refer Chapter 2, Q. 133.

(b) Write ALP to count total number of occurrences of data 9CH in a memory block of length 16 byte, starting from 1000H. Store count in Register E. 5

Ans. : Please refer Chapter 2, Q. 134.

(c) Write ALP to copy 10 consecutive bytes from memory 2025H to memory locations BCBCH onwords. 5

Ans. : Please refer Chapter 2, Q. 135.

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Oct. 2014

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	02	02	04	12	02	08	–	–	22
2	Instruction Set and Programming of 8085	–	–	04	12	–	–	06	30	42
3	Introduction to INTEL X-86 Family	–	–	–	–	01	04	–	–	04
4	Introduction of Microcontroller	01	01	01	03	01	04	–	–	08
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1 (A) Select the correct alternative and rewrite the following :

(a) There are ________ flags in Micro-processor 8085. 1

(i) 8 (ii) 6 (iii) 5 (iv) 16

(b) Micro-processor 8085 has ________ bit wide data bus. 1

(i) 8 (ii) 16 (iii) 32 (iv) 64

(c) ________ cable is most costly among all. 1

(i) UTP (ii) STP (iii) Fiber Optic (iv) Co-axial

(d) ________ is not a Micro-controller. 1

(i) 8052 (ii) 8032 (iii) Pentium (iv) 8051

Ans. : (a) (iii) (b) (i) (c) (iii) (d) (iii)

(B) Answer any two of the following :

(a) Write short note on 'Evolution of Micro-processor'. 3

Ans. : Please refer Chapter 1 Q.2.

(b) What is stack ? Give its related instructions in 8085. 3

Ans. : Please refer Chapter 1, Q. 41.

(c) Compare between Micro-controller 8051 and 8052. 3

Ans. : Please refer Chapter 4, Q. 4 and Q. 8.

Q. 2(A) Answer any two of the following :

(a) What is multiplexed address/data bus in 8085 ? Give its advantage. 3

Ans. : Please refer Chapter 1 Q.18.

(b) Explain 'Register Indirect' and 'Immediate' addressing mode with one example each. 3

Ans. : Please refer Chapter 2 Q. 2.

(c) Compare the characteristics of Co-axial and Fiber optic cable. 3

Ans. : Please refer Chapter 5 Q. 18.

(B) Answer any one of the following :

(a) The accumulator contain 05H, register B contain 08H, what will be contents of flags, on execution of ADD B instruction ? 4

Ans. : Please refer Chapter 1, Q. 46.

(b) Write a note on 'Pentium'. 4

Ans. : Please refer Chapter 3 Q. 3.

Q. 3 (A) Answer any two of the following :

(a) Explain the following instructions of 8085 : 3

(i) EI (ii) PCHL (iii) POP rp

Ans. : (i) EI - Please refer Chapter 2 Appendix.

(ii) PCHL - Please refer Chapter 2 Q.8(b).

(iii) POP rp - Please refer 2 Appendix.

(b) Describe the functions of following pins of 8085 ; 3

(i) SID (ii) READY (iii) ALE

Ans. : (i) SID - Please refer Chapter 1, Q. 13(i).

(ii) READY - Please refer Chapter 1 Q.11(i).

(iii) ALE - Please refer Chapter 1 Q. 9(i).

(c) Describe various 'Network Topology' with diagram. 3

Ans. : Please refer Chapter 5 Q. 29.

(B) Answer any one of the following :

(a) What is interrupt ? Explain software and hardware interrupt in 8085. 4

Ans. : Please refer Chapter 1 Q. 21 & 24.

(b) Explain memory map in micro-controller 8051, with neat diagram. 4

Ans. : Please refer Chapter 4 Q. 5.

Q. 4 (A) Answer any two of the following :

(a) The accumulator contain 3CH, what will be the effect on its content if following instructions are executed independently ? 3

(i) ANI 05H (ii) RRC (iii) MOV B, A

Ans. : Please refer Chapter 2, Q. 39.

(b) Explain in brief following connectivity devices : 3

(i) Hub (ii) Repeater (iii) Modem

Ans. : Please refer Chapter 5 Q. 41.

(c) Explain the following instruction in 8085 with example : 3

(i) RIM (ii) SIM

Ans. : Please refer Chapter 2 Appendix.

(B) Answer any one of the following :

(a) List the 'Access Methods' and explain any one. 4

Ans. : Please refer Chapter 5 Q. 34.

(b) Write down any four reasons of wireless media. 4

Ans. : Please refer Chapter 5 Q. 2 & 3.

Q. 5 Answer any two of the following :

(a) Write a program in assembly language to multiply two 8 bit data, where multiplier is stored at D000H and multiplicand is stored at D001H memory locations. Store the 16 bit product from memory location D002H. 5

Ans. : Please refer Chapter 2, Q. 136.

(b) Give the proper comments to following program. Also write the purpose of program : 5

Ans. : Please refer Chapter 2, Q. 137.

(c) There is block of memory, from 2501H to 250AH. Write a program to replace the odd numbers with data 'FFH' in given block. 5

Ans. : Please refer Chapter 2, Q. 138.

OR

Q. 5 Answer any two of the following :

(a) Write a program in assembly language to exchange the nibbles of each memory location contents of a block which begins from 2501H, the length of block is at 2500H. Store the result at same memory locations. 5

Ans. : Please refer Chapter 2, Q. 139.

(b) Write a program to check, weather 2 Hex digits stored at D000H are same or not. If digits are same then memory location D001H should contain 00H else FFH. 5

Ans. : Please refer Chapter 2, Q. 140.

(c) Write a program in assembly language to add 3 byte number stored form D000H with another 3 byte number stored from D100H memory address. Store the 3 byte result from memory location D200 starting with lower byte. 5

Ans. : Please refer Chapter 2, Q. 141.

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March 2015

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	03	09	03	12	–	–	22
2	Instruction Set and Programming of 8085	01	01	01	03	02	08	06	30	42
3	Introduction to INTEL X-86 Family	01	01	01	03	–	–	–	–	04
4	Introduction of Microcontroller	–	–	03	09	–	–	–	–	09
5	Networking Technology	01	01	04	12	01	04	–	–	17
	Total	04	04	12	36	06	24	06	30	94

Q. 1 **(A) Select the correct alternative and rewrite the following :**

(a) ____________Instruction would not affect zero flag. 1

(i) XRA A (ii) SUB A (iii) CMP A (iv) MVI A, 00H

(b) Data bus of 80286 MPU is of size __________. 1

(i) 8 bit (ii) 16 bit (iii) 32 bit (iv) 64 bit

(c) ____________ is used to store 8 bit opcode is 8085. 1

(i) IR (ii) PC (iii) SP (iv) Accumulator

(d) The device used is extend cable length of a network is _________. 1

(i) MODEM (ii) REPEATER (iii) HUB (iv) ROUTER

Ans. : (a) (iv) (b) (ii) (c) (i) (d) (ii)

(B) Answer any two of the following :

(a) Draw block diagram of generic microprocessor. 3

Ans. : Please refer Chapter 1 Q.5.

(b) State any six features of 8051 microcontroller. 3

Ans. : Please refer Chapter 4 Q.3.

(c) What is HUB ? Explain all the types of HUB. 3

Ans. : Please refer Chapter 5 Q.39.

Q. 2 **(A) Answer any two of the following :**

(a) Explain multiplexed Address and Data Bus of 8085 MPU. **3**

Ans. : **Please refer Chapter 1 Q.18.**

(b) Explain Star and Bus network topology **3**

Ans. : **Please refer Chapter 5 Q. 23 & 25.**

(c) State any six arithmetical and logical instructions of 8085 MPU. **3**

Ans. : **Arithmetical Instruction**

1. ADD r - Add register to Accumulator

2. SUB r - Subtract register from Accumulator

3. INR r - Increment register content by one

Logical Instruction

4. ANA r - Logical AND with accumulator

5. ORA r - Logically OR with Accumulator

6. XRA r - Exclusive OR with Accumulator

(B) **Answer any one of the following :**

(a) What are the Hardware interrupts ? Explain vectored and Non-vectored interrupts of 8085 MPU. **4**

Ans. : **Please refer Chapter 1 Q.26.**

(b) Explain the following instructions of 8085 MPU :

(i)	MOV B, M	(ii)	ADC C
(iii)	SPHL	(iv)	XCHG

Ans. :

(i) MOV B, M - Please refer Chapter 2 , Appendix.

(ii) ADC C - This instruction adds the contents of accumulator to the contents of reg. C and the contents of carry flag. The result is placed in accumulator.

Addressing - Register addressing

Bytes - 1 byte

Flag - All Affected

Group - Arithmetic Group

(iii) SPHL - Please refer Chapter 2 Q. 8(a).

(iv) XCHG - Please refer Chapter 2 , Appendix.

Q. 3 **(A) Answer any two of the following :**

(a) What is a single chip computer ? State its advantages. **3**

Ans. : **Please refer Chapter 4 Q. 2.**

(b) State any three features of Pentium processor. 3

Ans. : Please refer Chapter 3 Q. 3(v).

(c) Explain Ethernet protocol used in network. 3

Ans. : Please refer Chapter 5 Q. 31 & Q. 36.

(B) Answer any one of the following :

(a) Explain PUSH and POP instructions of 8085. 4

Ans. : Please refer Chapter 2 Appendix.

(b) Explain any four flags of 8085, giving example.. 4

Ans. : Please refer Chapter 1 Q. 39.

Please refer Chapter 1 Q. 42.

Q. 4 (A) Answer any two of the following :

(a) Explain function of the following pins of 8085 : 3

(i) $\overline{\text{INTA}}$ (ii) IO/$\overline{\text{M}}$ (iii) $\overline{\text{RD}}$

Ans. (i) Refer Chapter 1 Q. 16(2).

(ii) Refer Chapter 1 Q. 15(a).

(iii) Refer Chapter 1 Q. 9(ii).

(b) State any six applications of microcontrollers. 3

Ans. : Please refer Chapter 4 Q. 10.

(c) Compare twisted pair cable and coaxial cable. 3

Ans. : Please refer Chapter 5 Q. 17.

(B) Answer any one of the following :

(a) Explain the following : 4

(i) T-States (ii) Machine Cycle

(iii) Instruction cycle (iv) FETCH Cycle

Ans. : (i) : Please refer Chapter 1 Q. 55.

(ii) Please refer Chapter 1 Q. 55.

(iii) Please refer Chapter 1 Q. 55.

(iv) Please refer Chapter 1 Q. 56.

(b) Give advantages of Fiber Optic cable over an electrical cable. 4

Ans. : Electrical means co-axial or UTP & STP Cable

Please refer Chapter 5 Q. 16.

Q. 5 Answer any two of the following :

(a) Write ALP to multiply number stored at 8085H by 09H and store result at 8086 H and 8087 H, with lower byte at 8086H. 5

Ans. : Please refer Chapter 2, Q. 161.

(b) Write ALP to find 2's complement of a 16 bit number stored in DE pair. Store result in HL pair. 5

Ans. : Please refer Chapter 2, Q. 162.

(c) Locate smallest number in a block from 2050 H to 2060H and store it in memory location 2061 H. 5

Ans. : Please refer Chapter 2, Q. 163.

OR

(a) Write ALP to store data BCH in 20 continuous memory locations starting from 8081 H. 5

Ans. : Please refer Chapter 2, Q. 164.

(b) Write ALP to divide number at 6068H by a non-zero number at 6067 H. Store quotient at 6069H and remainder at 606AH. 5

Ans. : Please refer Chapter 2, Q. 165.

(c) Write ALP to clear register B, if number at memory location 20F9H is palindrome; otherwise store FFH in register B. 5

[Palindrome No. Ex. FF, 22, AA]

Ans. : Please refer Chapter 2, Q. 166.

Oct. 2015

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	04	12	02	08	–	–	21
2	Instruction Set and Programming of 8085	01	01	04	12	–	–	06	30	43
3	Introduction to INTEL X-86 Family	–	–	–	–	01	04	–	–	04
4	Introduction of Microcontroller	01	01	01	03	01	04	–	–	08
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1(A) Select the correct alternative & rewrite:

(a) In 8085 Microprocessor _______ Pin in used for demultiplexing of address/data bus. 1

(i) S_o (ii) ALE (iii) IO/$\overline{M}$ (iv) HOLD

(b) After the execution of POP rp instruction, SP gets _______ 1

(i) Incremented by one (ii) Decremented by one

(iii) Incremented by two (iv) Decremented by two

(c) 8051 _____ Bit Micro-Controller. 1

(i) 8 (ii) 4 (iii) 16 (iv) 32

(d) In _______ Topology, all devices are connected to a central hub. 1

(i) Ring (ii) Star

(iii) Bus (iv) None of the above

Ans. :	(a) (ii)	(b) (iii)	(c) (i)	(d) (ii)

(B) Answer any two of the following :

(a) Explain the terms in a Micro-computer : 3

(i) Address Bus (ii) Data Bus (iii) Control Bus

Ans. : Please refer Chapter 1 Q. 6.

(b) Explain the addressing modes of the following instructions of 8085 Micro-processor : 3

(i) STAX rp (ii) CMA (iii) LHLD addr

Ans. : (i) STAX rp : Please refer Chapter 2 Appendix (12)

(ii) CMA : Please refer Chapter 2 Appendix (17)

(iii) LHLD addr : Please refer Chapter 2 Appendix (9)

(c) State any six applications of a Mirco-contoroller. 3

Ans. : Please refer Chapter 4 Q. 10

Q. 2(A) Answer any two :

(a) Explain the function of the following registers in 8085 Micro-Processor : 3

(i) Stack Pointer

(ii) Instruction Register

(iii) Program Counter

Ans. : Please refer Chapter 1, Q. 35.

(b) Explain the following instructions of 8085 Micro-processor with suitable example of each : 3

(i) LXI rp (ii) XRA r (iii) RLC

Ans. : **(i) LXI rp : Please refer Chapter 2, Appendix (6)**

(ii) XRA r : Please refer Chapter 2, Appendix (7)

(iii) RLC : Please refer Chapter 2, Appendix (13)

(c) Explain in brief, any three situations where multiplexing is useful for data transmission. 3

(B) Answer any one of the following :

(a) Write the functions of following units in 8085 Micro-processor : 3

(i) ALU

(ii) Timing and Control

(iii) Serial I/O Control

(iv) Instruction Register and Decoder.

Ans. : **Please refer Chapter 1 Q. 34 & Q.35.**

(b) Explain the advantages of the following features of the Pentium Processor : 3

(i) Dual Pipelining (ii) On Chip Caches

(iii) Branch Prediction (iv) 64-bit Data Bus

Ans. : **Please refer Chapter 3 Q. 5.**

Q. 3 (A) Answer any of two following :

(a) State the conditions of $IO/\overline{M}$, S_0 and S_1 signals of 8085 Micro-processor for the following operations : 4

(i) MEMORY READY

(ii) I/O WRITE

(iii) I/O READ

Ans. : **Please refer Chapter 1, Q. 20 (II).**

(b) Describe in brief function of following pins in 8085 Micro-processor :

(i) READY (ii) CLKOUT (iii) $\overline{WR}$

Ans. : **Please refer Chapter 1, Q. 11 (i), Q. 16 (3), Q. 9 (3).**

(c) Explain the operation of token ring in networking with a suitable diagram. 3

Ans. : **Please refer Chapter 5 Q. 32.**

(B) Answer any one of the following :

(a) What is a T-state ? Explain the three steps in execution of an instruction in a Micro-processor. 4

Ans. : **Please refer Chapter 1 Q. 55.**

(b) What is a Micro-controller ? State any six features of 8051 Micro-controller. 4

Ans. : **Please refer Chapter 4 Q. 1 and 3.**

Q.4 (A) Answer any two of the following :

(a) The accumulator in 8085 Micro-processor contains the data 78H and register D contains data 33H. What will be the content of accumulator after execution of each of the following instructions independently. 4

(i) SUB D (ii) AND D (iii) CMA

Ans. : Please refer Chapter 2 Q. 40.

(b) Explain the following instructions of 8085 Micro-processor with suitable example of each : 4

(i) POP rp (ii) SPHL

Ans. : (i) POP rp : Please refer Chapter 2, Appendix.

(ii) SPHL : Refer Chapter 2, Q. 8.

(c) Explain the following connectivity devices :

(i) Router (ii) Repeater

Ans. : (i) Please refer Chapter 5 Q. 40.

(ii) Please refer Chapter 5, Q. 39.

Q. 4 (B) Answer any one of the fowling :

(a) Explain the following attributes of a transmission medium : 4

(i) Band Width (ii) EMI

(iii) Band Usage (iv) Attenuation

Ans. : Please refer Chapter 5 Q. 4.

(b) What is meant by a Protocol ? Explain the concept of TCP/IP Protocol. 4

Ans. : Please refer Chapter 5 Q. 36.

Q. 5 Answer any two of the following :

(a) Write an assembly language program to multiply the content of 2000H by the content of 2000H. store the 16 bit result in the memory location 2010H and 2011H. 5

Ans. : Please refer Chapter 2 Q. 142.

(b) Write an assembly language program to add the four byte number starting from C000H with another four byte number starting from C100H. Store the four byte result starting from C200H and carry at C204H. 5

Ans. : Please refer Chapter 2 Q. 143.

(c) Write an assembly language program to count the odd numbers in a memory block starting from 2300H to 2320H. Store the count at memory location 2400H. 5

Ans. : Please refer Chapter 2 Q. 144.

OR

Q. 5 Answer any two of the following :

(a) The two memory block starts from 3000H and 3100H each containing 16 bytes. Write an assembly language program to exchange the content of these blocks. 5

Ans. : Please refer Chapter 2 Q. 145.

(b) A memory block from 4000H containing 16 hexadecimal numbers. Write an assembly language program to count the numbers which has identical nibbles. Stores to count in memory location 4010H. 5

Ans. : Please refer Chapter 2 Q. 146.

(c) Write an assembly language program to test weather the data DCH is present in the memory block which starts from 2000H. If the data is present in block the HL pair should contain its address otherwise it should contains FFFFH. 5

(Test for the first occurrence only)

Ans. : Please refer Chapter 2 Q. 147.

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March 2016

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	–	–	02	06	02	08	–	–	14
2	Instruction Set and Programming of 8085	02	02	01	03	–	–	06	30	35
3	Introduction to INTEL X-86 Family	–	–	02	06	02	08	–	–	14
4	Introduction of Microcontroller	01	01	02	06	01	04	–	–	11
5	Networking Technology	01	01	05	15	01	04	–	–	20
	Total	04	04	12	36	06	24	06	30	94

Q. 1(A) Select the correct alternative & rewrite:

(a) ______ is a Micro-Controller. 1

(i) 8086 (ii) 8051 (iii) 8088 (iv) 80286

(b) __________ instruction does not affect the Flag. 1

(i) RAR (ii) CMP C (iii) XRA (iv) MOV A,B

(c) If length of cable is very long then ______ is used in between to bring the weakend signal to its original level. 1

(i) MODEM (ii) HUB (iii) REPEATER (iv) ROUTER

(d) ________ instruction is used for 16-bit addition. 1

(i) ADD (ii) ADI (iii) ADC (iv) DAD

Ans. : (a) (ii) (b) (iv) (c) (iii) (d) (iv)

(B) Answer any two of the following :

(a) Differentiate between Micro-controller and a Micro-processor. 3

Ans. : Please refer Chapter 4 Q. 11.

(b) Explain the following. 3

(i) Accumulator (ii) Program Counter

(iii) Stack Pointer

Ans. : Please refer Chapter 1 Q. 34 & Q. 35.

(c) Write a short note on MODEM. 3

Ans. : Please refer Chapter 5 Q. 37.

Q. 2(A) Answer any two :

(a) Explain the function of following pins of 8085 : 3

(i) HLDA (ii) SID (iii) READY

Ans. : (i) HLDA : Please refer Chapter 1 Q. 11.

(ii) SID : Please refer Chapter 1, Q, 13.

(iii) READY : Please refer chapter 1, Q, 11.

(b) Discuss in brief the members of X-86 Family begining from 80386 and upward. 3

Ans. : Please refer Chapter 3 Q. 3.

(c) Draw memory register map, of Micro-controller 8051. 3

Ans. : Please refer Chapter 4 Q. 5.

(B) Answer any one :

(a) Draw the labelled internal diagram of 8085 Micro-processor. 4

Ans. : Please refer Chapter 1 Q. 29.

(b) Explain in brief programming model of X-86 Family. 4

Ans. : Please refer Chapter 3 Q. 12 & 13.

Q. 3 (A) Answer any two :

(a) Explain any three Addressing Modes of 8085 with examples. 3

Ans. : Please refer Chapter 2 Q. 2.

(b) Explain in short : 3

(i) Start Topology (ii) Bus Topology

(iii) Ring Topology

Ans. : Please refer Chapter 5 Q. 29.

(c) Distinguish between LAN and WAN. 3

Ans. : Please refer Chapter 5 Q. 7.

(B) Answer any one :

(a) What is Vectored Interrupt? State the different hardware interrupts with their priorities and branching addresses. 4

Ans. : Please refer Chapter 1 Q. 24 & 28.

(b) Explain the advantages of following features of Pentium Processor : 4

(i) Dual-pipelining (ii) Prefetching

(iii) Branch Prediction (iv) Internal Data Bus

Ans. : Please refer Chapter 3 Q. 8.

Q. 4 (A) Answer any two :

(a) What is a Protocol ? Explain the concept of TCP/IP Protocol. 3

Ans. : Please refer Chapter 5 Q. 36.

(b) Explain the structure of Fiber Optic Cable. 3

Ans. : Please refer Chapter 5 Q. 14.

(c) Draw the labelled diagram of X-86 family Flag Register. 3

Ans. : Please refer Chapter 3 Q. 15.

(B) Answer any one :

(a) Discuss the Micro-controllers in 8051 family. 4

Ans. : Please refer Chapter 4 Q. 7.

(b) Write a note on Ethernet. 4

Ans. : Please refer Chapter 5 Q. 31.

Q. 5 Answer any two:

(a) Write an Assembly Language Program to multiply a number stored at location 1050 with a number at location 1051. Result is 2-byts. Stored result at locations 1052 and 1053. 5

Ans. : Please refer Chapter 2 Q. 148.

(b) Write an Assembly Language Program to transfer a block memory starting from 1050H to 1059H to a new location starting from 1070H to 1079H. 5

Ans. : Please refer Chapter 2 Q. 149.

(c) A two byte number is stored at location C000 H and C001 H. Write on Assembly Language Program to rotate this number to left side by 3 Places and stored the rotated number in BC register pair. 5

Ans. : Please refer Chapter 2 Q. 150.

OR

Q. 5 Answer any two :

(a) Write an Assembly Language program to add 2 decimal numbers stored at 1050 H and 1051 H. Stored result at 1052 H and 1053 H. 5

Ans. : Please refer Chapter 2 Q. 151.

(b) Accumulator contents of 8085 are B7H and register B contents are A5 H. What will be the effect of following instructions on the contents of Accumulator, When executed independently ? 5

(i) ADI 05 (ii) CMP B

(iii) CMA (iv) XRA B

(v) ORA B

Ans. : (i) AC H (ii) B7 H (iii) 48 H (iv) 12 H (v) B7 H

(c) Write an Assembly Language Program to increment the contents of alternate memory locations each by two from 1051 H to 1060 H. 5

\ns. : Please refer Chapter 2 Q. 152.

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July 2016

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	04	12	02	08	–	–	21
2	Instruction Set and Programming of 8085	01	01	04	12	–	–	06	30	43
3	Introduction to INTEL X-86 Family	–	–	–	–	01	04	–	–	04
4	Introduction of Microcontroller	01	01	01	03	01	04	–	–	08
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1(A) Select the correct alternative and rewrite the following :

(a) When RST 7.5 vector interrupt is activated in 8085 microprocessor the control is transfered to ________. 1

(i) 0024 H (ii) 002C H (iii) 0034 H (iv) 003C H

(b) In MOV A, M instruction ____ is used to point the memory location. 1

(i) HL (ii) PC (iii) SP (iv) PSW

(c) ____ is a Microcontroller Chip. 1

(i) 8080 (ii) P-IV (iii) 8052 (iv) 8086

(d) Thinnet cable can reliably transmit a signal upto ____ meter without connectivity devices. 1

(i) 500 (ii) 185 (iii) 1000 (iv) 10,000

Ans. : (a) - (iv), (b) - (i), (c) - (iii), (d) - (ii),

Q. 1(B) Answer any two of the following :

(a) Draw a well labelled block diagram of a generic microprocessor. 3

Ans. : Please refer Chapter 1 Q. 5.

(b) Explain register indirect and immediate addressing modes of 8685 microprocessor with one example of each. 3

Ans. : Please refer Chapter 2 Q. 3.

(c) With a suitable block diagram, explain memory register map a 8051 microcontroller. 3

Ans. : Please refer Chapter 4 Q. 5.

Q. 2(A) Answer any two of the following :

(a) Explain the function of following units in 8085 Microprocessor : 3

(i) Instruction decoder

(ii) Increment - Decrement address latch

(iii) ALU

Ans. : (i) Please refer Chapter 1 Q. 35(c).

(ii) Please refer Chapter 1 Q. 34(III).

(iii) Please refer Chapter 1 Q. 35(a).

(b) Explain the following instructions of 8085 Microprocessor. 3

(i) LDAX rp (ii) XCHG (iii) DAD rp

Ans. : (i) Please refer Chapter 2 Appendix Gr I 11.

(ii) Please refer Chapter 2 Appendix Gr I 13.

(iii) Please refer Chapter 2 Appendix Gr II 19.

(c) Write in short any three, reasons to explain the usefulness of wireless network. 3

Ans. : Please refer Chapter 5 Q. 2 & Q. 3.

Q. 2(B) Answer any one of the following :

(a) Draw a neat labelled block diagram of 8085 Microprocessor. 4

Ans. : Please refer Chapter 1 Q. 29.

(b) Compare any four attributes of 8086 and 486 DX Microprocessor. 4

Ans. : Please refer Chapter 3 Q. 3(I, IV).

Q. 3(A) Answer any two of the following :

(a) What do you mean by a Vector Interrupt ? List all hardware interrupts of 8085 microprocessor according to their priority order. Which of them is non markable ? 3

Ans. : Please refer Chapter 1 Q. 28 & 22.

(b) Describe in brief, function of following pins in 8085 Microprocessor : 3

(i) $\overline{RD}$ (ii) SOD (iii) ALE

Ans. : (i) Please refer Chapter 1 Q. 9.

(ii) Please refer Chapter 1 Q. 15.

(iii) Please refer Chapter 1 Q. 9.

(c) Explain ethernet in short. State any four ethernet Topologies. 3

Ans. : Please refer Chapter 5 Q. 31.

Q. 3(B) Answer any one of the following :

(a) The flag register of 8085 Microprocessor contains the data D9 H. Interpret it's meaning. 4

Ans. : Please refer Chapter 1 Q. 52.

(b) What is a Microcontroller ? State any six application of a microcontroller. 4

Ans. : Please refer Chapter 4 Q. 1 and Q. 10.

Q. 4(A) Answer any two of the following :

(a) The accumulator in 8085 contains the data AAH and register B contains 55H. What will be the contents of accumulator offer execution of each of the following instructions in independently : 3

(i) ADD B (ii) ORA B (iii) RRC

Ans. : (i) FFH, (ii) FFH, (iii) 55H

(b) Explain the following instructions of 8085 Microprocessor with suitable example :

(i) XTHL (ii) PCHL 3

Ans. : (i) Please refer Chapter 2 Appendix Gr V-5.

(ii) Please refer Chapter 2 Appendix Gr IV-8.

(c) What is a MODEM ? Why it is necessary ? State any one reallife application of MODEM. 3

Ans. : Please refer Chapter 5 Q. 37.

Q. 4(B) Answer any one of the following :

(a) Compare any four attributes of Coaxial thicknet Cable with UTP cable. 4

Ans. : Please refer Chapter 5 Q. 19.

(b) What is meant by a Protocol ? Explain the concept of TCP/IP protocol. 4

Ans. : Please refer Chapter 5 Q. 36.

Q. 5 Answer any two of the following :

(A) Write an Assembly Language Program to add the content of a block of memory comprising of 16 bytes, starting from 2000 H. The two byte such is to be stored in memory location 2010 H (LSB) and 2011 H (MSB). 5

Ans. : Please refer Chapter 2 Prog. 104 (make necessary changes)

(B) A memory block starts from 2100 H and end at 210EH. Write an language program to insert a byte 2CH at memory location 2105 H an the memory block accordingly. 5

Ans. : Question not clear

(C) Write an assembly language program to find the absolute difference numbers stored at C200 H and C201 H. Store the result at C202 H. 5

Ans. : Please refer Chapter 2 Prog. 78. (make necessary changes)

OR

Q. 5 Answer any two of the following :

(A) A memory block starts from C301 H and its block length count is stored at C300 H. Write an assembly language program to count the even numbers and odd numbers present in the block. Store the even number count at C400H and odd number count at C401 H. 5

Ans. : Please refer Chapter 2 Q. 153.

(B) Write an Assembly Language Program to separate the digits of a hex number stored at 2400 H. Add these digits and store the sum at 2401 H. 5

Ans. : Please refer Chapter 2 Prog. 40. (make necessary changes)

(C) Write an Assembly Language Program to pickup the largest number from a memory block starting from D000H containing twenty numbers. Store he largest number at D050H. 5

Ans. : Please refer Chapter 2 Prog. 1. (make necessary changes)

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March 2017

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
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2	Instruction Set and Programming of 8085	01	01	04	12	–	–	06	30	43
3	Introduction to INTEL X-86 Family	01	01	01	03	–	–	–	–	04
4	Introduction of Microcontroller	–	–	–	–	02	08	–	–	08
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1(A) Select correct options and rewrite the following :

(a) The flag register of 8085 microprocessor contains ______ flags. 1

(i) 8 (ii) 3 (iii) 7 (iv) 5

(b) ANA, r instruction comes under ______ group. 1

(i) Arithmetic (ii) Logical

(iii) Branch (iv) Data Transfer

(c) The maximum physical memory can be addressed by 80286 microprocessor is __________. 1

(i) 640 KB (ii) 1 MB (iii) 16 MB (iv) 4 KB

(d) ______ cable uses light signals to transmit data. 1

(i) Fiber Optic (ii) Coaxial

(iii) UTP (iv) STP

Ans. : (a) - (iv), (b) - (ii), (c) - (iii), (d) - (i)

Q. 1(B) Solve any two of the following :

(a) Explain functions of the following pins of 8085 Microprocessor : 3

(i) Multiplexed address/data bus pin (AD0 - AD7)

(ii) RST 6.5 (iii) CLK (OUT)

Ans. : Please refer Chapter 1 Q. 14.

(b) Write the addressing mode and length in bytes of the following instructions : 3

(i) CPI 10 H (ii) MOV M, B . (iii) SHLD C009 H

Ans. : (i) Immediate Addressing Modes word size 2 byte

(ii) Register Indirect Addressing Modes word size 1 byte

(iii) Direct Addressing Modes word size 3 byte

(c) Compare any three characteristics of Twisted Pair Cable with Coxial Cable. 3

Ans. : Please refer Chapter 5 Q. 17.

Q. 2(A) Solve any two of the following :

(a) Define the following terms with suitable diagrams : 3

(i) T State (ii) Machine Cycle (iii) Instruction Cycle

Ans. : Please refer Chapter 1 Q. 55.

(b) What is Wireless Media ? Write any two advantages of Wireless Media. 3

Ans. : Please refer Chapter 5 Q. 2.

(c) The accumulator in 8085 microprocessor contains data 71H register E contains data 39H. What will be the contents of accumulator in Hexadecimal after execution of the following instructions independently ? 3

(i) ADD E (ii) ORA E (iii) RRC

Ans. : (i) AAH, (ii) 79H, (iii) B8H

Q. 2(B) Solve any one of the following :

(a) What is Microcontroller ? State any three advanced features of 8052 microcontroller over 8051 microcontroller. 4

Ans. : Please refer Chapter 4 Q. 9.

(b) What is Vectored Interrupt ? State all hardware interrupts with their vectored addresses, write the priorities of hardware interrupts. 4

Ans. : Please refer Chapter 1 Q. 22 and 28.

Q. 3(A) Solve any two of the following :

(a) Write any three difference points between Memory Mapped I/O and I/O Mapped I/O Addressing Scheme. 3

Ans. : Please refer Chapter 1 Q. 20.

(b) Explain the following instructions of 8085 Microprocessor with one example of each : (i) PUSH PSW (ii) INX rp (iii) DAD rp 3

Ans. : (i) Please refer Chapter 2 Appendix V 2.

(ii) Please refer Chapter 2 Appendix II 15.

(iii) Please refer Chapter 2 Appendix II 19.

(c) Write a short note on Modem. 3

Ans. : Please refer Chapter 5 Q. 37.

Q. 3(B) Solve any one of the following :

(a) Write any two features of following microcontrollers :

(i) 8048 (ii) 8052 (iii) 8031 (iv) 8050

Ans. : Please refer Chapter 4 Q. 7.

(b) What is Ehternet ? Discuss different types of Ethernet. 4

Ans. : Please refer Chapter 5 Q. 31, other part of Question out of syllabus.

Q. 4(A) Solve any two of the following :

(a) Compare any three attributes of 80386 and 80486 Microprocessor. 3

Ans. : Please refer Chapter 3 Q. 3.

(b) Write any three instructions to make Accumulator Zero. 3

Ans. : Please refer Chapter 2 Q. 5.

(c) What is Microprocessor ? List its functions. 3

Ans. : Please refer Chapter 1 Q. 1.

Q. 4(B) Solve any one of the following :

(a) Write a function of following functional units of 8085 Microprocessor : 4

(i) Instruction Decoder (ii) General Purpose Register

(iii) Data/Address Buffer (iv) Status Register

Ans. : Please refer Chapter 1 Q. 5, Q. 34, Q. 36 and Q. 5.

(b) What is Transmission Media ? Explain in short six characteristics of Transmission Media. 4

Ans. : Please refer Chapter 5 Q. 1 and Q. 6.

Q. 5 Solve any two of the following :

(a) Write a Assembly Language Program to copy a block of data having starting address 4500 H to new location starting from 4600 H. The length of block is stored at memory location 44FF H. 5

Ans. : Please refer Chapter 2 Q. 154.

(b) Write an Assembly Language Program to add two 8-bits BCD numbers stored at memory location 4500 H and 4501 H. Store the two byte BCD result from memory location 4502 H onwards. 5

Ans. : Please refer Chapter 2 Q. 155.

(c) Write an Assembly Language Program to fill the memory locations 4500 H to 4504 with the Hexadecimal numbers 09 H to ODH respectively. 5

Ans. : Please refer Chapter 2 Q. 156.

OR

Q. 5 Solve any two of the following :

(a) Write an Assembly Language Program to exchange the nibbles o8-bit number stored in memory location 4500H. Store the result at memory location 4501H. 5

Ans. : Please refer Chapter 2 Q. 157.

(b) A block of data is stored in memory location 4500 H. The length of block is stored in memory location 44FFH. Write an Assembly Language Program that searches for the first occurrence of data D9H in given block. Store the address of this occurrence in H.L. pair. If the number is not found then HL pair should contain 5000 H. 5

Ans. : Please refer Chapter 2 Q. 158.

(c) A block of data is stored from memory location 4501H and onwards. The length of the block is stored at memory location 4500H. Write an Assembly Language Program to find the sum of block of data. Store the two byte result from memory location 4600. 5

Ans. : Please refer Chapter 2 Q. 159.

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July - 2017

Instruction :
(1) All questions are compulsory.
(2) Figures to the right indicate full marks
(3) Draw neat diagrams wherever necessary.
(4) Use of any type of calculator is not allowed.
(5) Comments are must in Assembly Language Programs.

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
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2	Instruction Set and Programming of 8085	01	01	04	12	–	–	06	30	43
3	Introduction to INTEL X-86 Family	01	01	01	03	–	–	–	–	04
4	Introduction of Microcontroller	01	01	01	03	01	04	–	–	08
5	Networking Technology	–	–	01	03	03	12	–	–	15
	Total	04	04	10	30	06	24	06	30	88

Q. 1(A) Select correct alternative and rewrite the following sentence :

(a) In CPU, the register which keeps the track of address of next instruction to be fetched is called ________. 1

(i) Instruction Register (ii) Program Counter

(iii) Stack Pointer (iv) Accumulator

(b) ________ is three-byte instruction of 8085. 1

(i) CMA (ii) ADI

(iii) XCHG (iv) LDA

(c) Intel 8051 Microcontroller has ______ RAM. 1

(i) 128×8 (ii) $4K \times 8$

(iii) 64×8 (iv) $8K \times 8$

(d) The duty 32-byte Microprocessor from the following is ______. 1

(i) 8086 (ii) 8085

(iii) 80386 (iv) 80586

Ans. : (a) (ii) Program Counter

(b) (iv) LDA

(c) (i) 128×8

(d) (iii) 80386

Q. 1(B) Answer any two of the following :

(a) Explain the function of following pins of Intel 8085 : 3

(i) SOD **(Ch. 1, Q. 15)**

(ii) READY **(Ch. 1, Q. 11)**

(iii) HLDA **(Ch. 1, Q. 11)**

(b) Explain Register direct and Register indirect addressing modes of Intel 8085 with suitable examples. **(Ch. 2, Q. 2 and 3)** 3

(c) Draw and explain the programming model of 16-bit version of Intel X-86 Microprocessor family. **(Ch. 3, Q. 13)** 3

Q. 2(A) Answer any two of the following :

(a) Write any six applications of Microcontroller. **(Ch. 4, Q. 10)** 3

(b) Compare Thicknet and Thinnet Coaxial Cable. (Atleast 3 points) **(Ch. 5, Q. 7)** 3

(c) Draw and explain programming model of Intel 8085 Microprocessor. **(Ch. 1, Q. 32)** 3

Q. 2(B) Answer any one of the following

(a) Explain I/O Mapped I/O Scheme in 8085 Microprocessor. **(Ch. 1, Q. 20)** 4

(b) Compare any four attribute of UTP and Fiber Optic Cable. **(Ch. 5, Q. 15)** 4

Q. 3(A) Solve any two of the following :

(a) Explain the function of following instructions of Intel 8085 : 3

(i) DAD **(Appendix II, 19)**

(ii) RAL **(Appendix III, 15)**

(iii) CMC **(Appendix III, 18)**

(b) What is an Interrupt ? List any four hardware Interrupts of Intel 8085 with their vector addresses. **(Ch. 1, Q. 21 and 22)** 3

(c) Accumulator contains data A4H and Register E contains data 69H write the contents of Accumulator in hex digits after execution of each of the following instructions independently : 3

Ans. :

(i) ANA E = 20 H (ii) CMP E = A4H (iii) ORA = EDH

Q. 3(B) Answer any one of the following :

(a) What is Networking ? State any three differentiating points between LAN and WAN. **(Ch. 5, Q. 7)** 4

(b) Flag register contains data D5H. Interprete its meaning. **(Ch. 1, Q. 53)** 4

Q. 4(A) Answer any two of the following :

(a) Write appropriate instructions for each of the following tasks : 3

(i) Add contents of DE pair to fit pair.

(ii) Store the contents of Accumulator to memory location pointed by BC pair.

(iii) Rotate contents of Accumulator towards left with carry bit.

Ans. :

(i) Add contents of DE pair to fit pair. - **DAD D**

(ii) Store the contents of Accumulator to memory location pointed by BC pair. - **STAX B**

(iii) Rotate contents of Accumulator towards left with carry bit. - **RLC**

(b) Write any three primary functions of Microprocessor. **(Ch. 1, Q. 4)**

(c) Write short note on Ethernet Protocol. **(Ch. 5, Q. 31)** 3

Q. 4(B) Solve any one of the following :

(a) Explain memory map of Intel 8051 Microcontroller with help of diagram. **(Ch. 4, Q. 5)** 4

(b) Explain in brief following access methods : **(Ch. 5, Q. 34)** 4

(i) Polling (ii) Token Passing

Q. 5(A) Answer any two of the following :

(a) Write an Assembly Language Program to fill the memory block stored from 7601H to 760FH with the data OOH and FFH alternatively. **(Ch. 2, Q. 167)** 5

(b) Write an Assembly Language Program to search the data byte A4H in a memory block stored from 990111 to 990AH. If the search is successful, the HL register pair should contain the address of the location where the specified data byte is found; else, the HL pair should contain 0000H. **(Ch. 2, Q. 168)** 5

(c) Write an Assembly Language Program to separate the two nibbles of an 8-bit number stored at 7501H. Store the low-order nibble and high-order nibble, respectively, at the locations 7502H and 7503H. **(Ch. 2, Q. 160)** 5

OR

Q. 5 Answer any two of the following :

(a) Write an Assembly Language Program to take the sum of the 8-bit contents of a memory block stored from 2201H to 220AH. Stoe the 2-byte result at the locations 220BH and 220CH starting with LOB (Lowers Order Byte). **(Ch. 2, Q. 169)** 5

(b) Write an Assembly Language Program to count the total number of O (Low) bits in an 8-bit number stored at the location 4301H. Store the result (count) at the memory location 4302H. **(Ch. 2, Q. 170)** 5

(c) Write an Assembly Language Program to find the greates1 number in a memory block stored from 6201H to 620AH. Store the result at the location 620BH. **(Ch. 2, Q. 171)** 5

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March - 2018

Instruction :
(1) All questions are compulsory.
(2) Figures to the right indicate full marks
(3) Draw neat diagrams wherever necessary.
(4) Use of any type of calculator is not allowed.
(5) Comments are must in Assembly Language Programs.

Distribution of Marks- Questionwise and Topicwise

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3	Introduction to INTEL X-86 Family	–	–	01	03	–	–	–	–	03
4	Introduction of Microcontroller	01	01	01	03	01	04	–	–	08
5	Networking Technology	–	–	02	06	03	12	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1(A) Select correct options and rewrite the following :

(a) Intel 8085 is a/an _______ bit Microprocessor. 1

(i) 16 (ii) 4

(iii) 8 (iv) 32

(b) The instruction PCHL belongs to ________ group. 1

(i) Data transfer (ii) Logical

(iii) Arithmetic (iv) Branching

(c) Stack pointer of 8085 holds __________. 1

(i) 8 bit address (ii) 16 bit data

(iii) 16 bit address (iv) 8 bit data

(d) The instruction set of intel 8051 micro-controller contains total ______ instruction. 1

(i) 111 (ii) 72

(iii) 74 (iv) 100

Ans. : (a) (iii) 8

(b) (iv) Branching

(c) (iii) 16 bit address

(d) (i) 111

Q. 1(B) Answer any two of the following :

(a) Explain the function of following pins on Intel 8085 : 3

(i) $\overline{RD}$ **(Ch 1, Q. 9)**

(ii) $\overline{WR}$ **(Ch 1, Q. 9)**

(iii) IO/$\overline{M}$ **(Ch 1, Q. 15)**

(b) Explain direct and immediate addressing modes of Intel 8085 with suitable examples. **(Ch 2, Q. 2)** 3

(c) Explain any three important features of Pentium processor. **(Ch 3, Q. 3)** 3

Q. 2(A) Answer any two of the following :

(a) Write the RAM and ROM size of 8048, 8049 and 8050 microcontrollers. **(Ch 4, Q. 7)** 3

(b) Explain Fiber-optic cable with a neat diagram. **(Ch 5, Q. 14)** 3

(c) Explain the conditional CALL instructions of Intel 8085. **(Ch 2, Q. 11)** 3

Q. 2(B) Answer any one of the following :

(a) Draw the functional block diagram of Intel 8085. **(Ch 1, Q. 29)** 4

(b) Explain in brief the following access method : **(Ch 5, Q. 34)**

(i) Contention (ii) Token Passing 4

Q. 3(A) Answer any two of the following :

(a) What do you mean by Interrupt ? List all the software interrupts of Intel 8085. **(Ch 1, Q. 21 and Q. 23)** 3

(b) The registers A and C of 8085 contains the data E2H and 47H. What will be the contents of Accumulator in Hex digits after execution of each of the following instructions independently ? 3

(i) SUB C

(ii) XRA C

(iii) ADD C

Ans. :

(i) SUB C = 9BH

(ii) XRA C = A5H

(iii) ADD C = 29 H Cy = 1

(c) Draw a bit pattern of flag register of Intel 8085 and write the functions of any four flags. **(Ch 1, Q. 39)** 3

Q. 3(B) Answer any one of the following :

(a) Explain in brief the following connectivity devices : 4

(i) Repeater **(Ch 5, Q. 39)** (ii) Router **(Ch 5, Q. 40)**

(b) Define the terms - Machine Cycle, Instruction Cycle and T-state with a timing diagram. **(Ch 1, Q. 55)** 4

Q. 4(A) Answer any two of the following :

(a) Explain the function of following instructions of Intel 8085 : 3

(i) LXI H, 2900H **(Appendix I, 6)**

(ii) LDA 6605H **(Appendix I, 7)**

(iii) PUSH B **(Appendix IV, 8)**

(b) Explain the function of ALU with a simple block diagram. **(Ch 1, Q. 30)** 3

(c) What do you mean by Protocol ? Explain the concept of TCP/IP Protocol. **(Ch 5, Q. 36)** 3

Q. 4(B) Answer any one of the following :

(a) What is Microcontroller ? State any six important features of Intel 8051 Microcontroller. **(Ch 4, Q. 1 and Q. 3)** 4

(b) Explain Ring and Star Topologies with simple diagrams. **(Ch 5, Q. 24 and Q. 25)** 4

Q. 5 Answer any two of the following :

(a) Write an Assembly Language Program to multiply an 8-bit number stored at 4301H by another 8-bit number stored at 4302H. Store the result at the location 4303H and 4304H beginning with LOB (Lower Order Byte) **(Ch 2, Q. 172)** 5

(b) Write an Assembly Language program to fill in the memory locations starting from 6900H and onward with the decimal numbers 0 to 99. **(Ch 2, Q. 173)** 5

(c) Write an Assembly Language Program to take the 2's complement of an 8-bit number stored at 3301H. Store the result at the memory location 3302H. **(Ch 2, Q. 174)** 5

Q. 5 Answer any two of the following :

(a) Write an Assembly Language Program to count the occurrence of the data byte ACH in a memory block stored from 7401H to 7405H. Store the count at the memory location 7406H. **(Ch 2, Q. 175)** 5

(b) Write a subroutine in assembly language to fill the memory locations 7301H to 73FFH with the hexadecimal numbers 01H to FFH respectively. **(Ch 2, Q. 176)** 5

(c) Write an Assembly Language Program to count the total number of even data bytes occurring in a block of data stored from 9201H to 902AH. Store the result (count) at the memory location 9500H. **(Ch 2, Q. 177)** 5

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July - 2018

Instruction :
(1) All questions are compulsory.
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(3) Draw neat diagrams wherever necessary.
(4) Use of any type of calculator is not allowed.
(5) Comments are must in Assembly Language Programs.

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3	Introduction to INTEL X-86 Family	01	01	02	06	01	04	–	–	11
4	Introduction of Microcontroller	01	01	01	03	–	–	–	–	04
5	Networking Technology	–	–	02	06	03	12	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1(A) Select the correct alternatives and rewrite the following :

(a) Microprocessor 8085 is manufactured by ________. 1

(i) Intel (ii) Motorola

(iii) Zilog (iv) Toshiba

(b) ________ instruction is a Arithmetic group of instruction. 1

(i) MOV reg, reg (ii) RRC

(iii) NOP (iv) ADD reg.

(c) __________ is a microcontroller. 1

(i) Intel 8085 (ii) Intel 8086

(iii) Intel 8052 (iv) Intel 8008

(d) Intel 80586 was introduced in ________. 1

(i) 1978 (ii) 1993

(iii) 1996 (iv) 1984

Ans. : (a) (i) Intel

(b) (iv) ADD reg.

(c) (iii) Intel 8052

(d) (ii) 1993

Q. 1(B) Answer any two of the following :

(a) Explain following pins of 8085 Microprocessor : 3

(i) INTR **(Ch 1, Q. 10(b))**

(ii) HOLD **(Ch 1, Q. 10(a))**

(iii) HLDA **(Ch 1, Q. 11(4))**

) Explain any three instructions of logical group of 8085 Microprocessor.
(Ch 2, Appendix III-1, (4), (7) and (1)) 3

.:) Explain 16-bit version of X-86 family programming model with suitable diagram.
(Ch 3, Q. 13) 3

Q. 2(A) Answer any two of the following :

(a) Explain following unit of 8085 Microprocessor : 3

(i) Temporary Register **(Ch 1, Q. 34(II))**

(ii) Serial I/O Control **(Ch 1, Q. 34(V))**

(iii) Interrupt Control

(b) What is Network ? Differentiate between LAN and WAN. **(Ch 5, Q. 7)** 3

(c) Compare Microcontroller 8051 with 8052. **(Ch 4, Q. 8)** 3

Q. 2(B) Answer any one of the following :

(a) Draw a labeled block diagram of 8085 Microprocessor. **(Ch 1, Q. 29)** 4

(b) Explain Token Passing and Polling Access Method. **(Ch 5, Q. 34)** 4

Q. 3(A) Answer any two of the following :

(a) Draw and explain functional block diagram of ALU. **(Ch 1, Q. 30)** 3

(b) Compare Intel 80286 Microprocessor with Intel 80486. **(Ch 3, Q. 10)** 3

(c) Accumulator contain data 45H and register B contain data 82H. What will be the result in Accumulator after execution of each instruction independently.

(i) XRA B (ii) ADI 54H (iii) ANI 57H **(Ch 2, Q. 44)** 3

Q. 3(B) Answer any one of the following :

(a) Differentiate between Co-axial Cable and Fiber Optic Cable. **(Ch 5, Q. 18)** 4

(b) Explain 16 bit Register used in 8085 Micro-processor. **(Ch 1, Q. 34 & Q. 35)** 4

Q. 4(A) Answer any two of the following :

(a) Define 3

(i) T-state (ii) Machine Cycle (iii) Instruction Cycle

(Ch 1, Q. 55)

(b) Explain Conditional CALL and Conditional JUMP instructions. (Any three each) **(Ch 2, Q. 10 & Q. 11)** 3

(c) Give any three advantages and three disadvantages of Wireless Media. **(Ch 5, Q. 2 & Q. 3)** 3

Q. 4(B) Answer any one of the following :

(a) Compare Inter 80386 with Intel 80486. **(Ch 3, Q. 3(III) & (IV))** 4

(b) What is Transmission Media ? Give six characteristics of transmission media. **(Ch 5, Q. 1 & Q. 6)** 4

Q. 5 Answer any two of the following :

(a) Write an Assembly Language Program to add two 16-bit numbers. The numbers are stored at memory Location C030H and C031H and the second number stored at C032H and C033H. Store result at memory location C034H and C035H. Store final carry at C036H. **(Ch 2, Program 104)** 5

(b) Write the appropriate instructions for the following task : 5

(i) Load accumulator from B register.

(ii) Complement the accumulator

(iii) Add 01H with the accumulator

(iv) Store the content of accumulator at the memory location addressed by the BC register pair.]

(v) Clear the accumulator. **(Ch 2, Q. 45)**

(c) A block data is stored in memory location from 9101H to 91FFH. Write an Assembly Language Program to transfer the block in reverse order to memory location 9200H and onwards. **(Ch 2, Program 22)** 5

OR

Q. 5 Answer any two of the following :

(a) Three the following program and write the purpose of the program : 5

Label	Instruction	Comments
	LX1 H, 2500 H	; Load HL by 2500H
	MVI B, 01 H	; Load immediate reg B by 01
	MOV A, M	; Take data from memory to accumulator
	CMA	; Complement the accumulator content
	ADD B	; Add 01 to accumulator
	INX H	; Increment HL by 1
	MOV M, A	; Transfer content of accumulator to memory
	HLT	; Stop

Purpose : Perform 2's complement of 8 bit number an store result at consicative memory location. (Ch 2)

(b) An ASCII code for hexadecimal digit is stored at memory location 2000H write an assembly language program to convert if into hex a decimal number and store it at 3000H. **(Ch 2, Program 55)** 5

) Write the appropriate comment for the following program as well as its purpose. 5

Note that square decimal number from 0 to 9 are stored in memory location from 1500H to 150gH respectively. The above range (0 to 9) decimal is stored at 1234H.
(Ch 2, Program 178)

Label	Instruction	Comments
	LDA 1234H	; ________
	MOV L, A	; ________
	MVI H, 15H	; ________
	MOV A, M	; ________
	STA 1235H	; ________
	HLT	; ________

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March - 2019

Instruction :
(1) All questions are compulsory.
(2) Figures to the right indicate full marks
(3) Draw neat diagrams wherever necessary.
(4) Use of any type of calculator is not allowed.
(5) Comments are must in Assembly Language Programs.

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	05	15	01	04	–	–	20
2	Instruction Set and Programming of 8085	01	01	02	06	01	04	06	30	41
3	Introduction to INTEL X-86 Family	–	–	–	–	01	04	–	–	04
4	Introduction of Microcontroller	01	01	02	06	01	04	–	–	11
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1(A) Select the correct alternatives and rewrite the following :

(a) ________ bits of flag register of 8085 Microprocessor are unused. 1
(i) 1 (ii) 2 (iii) 3 (iv) 4

(b) The first byte of an 8085 instruction always contains ________. 1
(i) Opcode (ii) Data
(iii) Address (iv) None of these

(c) The 8081 Micro-controller has instruction set of ________ instructions. 1
(i) 101 (ii) 110 (iii) 99 (iv) 111

(d) ________ of the following is an example of wireless media. 1
(i) Optic Fibre (ii) Microwave
(iii) UTP (iv) STP

Ans. : (a) (iii) 3 (b) (i) Opcode
(c) (iv) 111 (d) (ii) Microwave

Q. 1(B) Solve any two of the following :

(a) Explain the functions of following pins of 8085 Micro Processor : 3

(i) $IO/\overline{M}$ **(Ch 1, Q. 15(a))** (ii) $\overline{RD}$ **(Ch 1, Q. 16(ii))**

(iii) $\overline{INTD}$ **(Ch 1, Q. 16(2))**

(b) Differentiate between LAN and WAN. (Any 3 points) **(Ch 5, Q. 7)** 3

(c) State any six features of 8051 micro-controller. **(Ch 4, Q. 3)** 3

Q. 2(A) Solve any two of the following :

(a) Define following terms : 3

(i) T-State (ii) Machine Cycle (iii) Instruction Cycle

(Ch 1, Q. 55)

(b) Considering following points, explain the given instruction : 3

Instruction : INX rp

(i) Group of Instruction (ii) Addressing Mode

(iii) Number of Bytes (iv) Flag Affected

(v) Explain with example **(Ch 2, Appendix-II, Q. 15)**

(c) Explain Micro-controller and state any two of its advantages over Micro-processor. **(Ch 4, Q. 2)** 3

Q. 2(B) Solve any one of the following :

(a) Draw a neat and labeled block diagram of Micro-computer. **(Ch 1, Q. 3)** 4

(b) Explain STAR Topology with diagram. Also give two advantages and disadvantages. **(Ch 5, Q. 25)** 4

Q. 3(A) Solve any two of the following :

(a) Write the functions of following blocks of 8085 Micro-processor : 3

(i) Accumulator **(Ch 1, Q. 5(ii)(a))**

(ii) Instruction Register **(Ch 1, Q. 5(ii)(b))**

(iii) Decoder **(Ch 1, Q. 5(iv))**

(b) Give any two instructions of following addressing modes : **(Ch 2, Q. 46)** 3

(i) Immediate (ii) Register Indirect (iii) Register

(c) Explain TCP/IP protocol in detail. **(Ch 5, Q. 44)** 3

Q. 3(B) Solve any one of the following :

(a) Explain following network devices with diagram : 4

(i) Router **(Ch 5, Q. 40)**

(ii) Repeater **(Ch 5, Q. 39(II))**

(b) Explain memory register map of 8051 Micro-controller with diagram. **(Ch 4, Q. 5)** 4

Q. 4(A) Solve any two of the following :

(a) What are Hardware Interrupts ? List them according to priority. Also state call location of these interrupts. **(Ch 1, Q. 26 & Q. 28)** 3

(b) Explain ALU of 8085 Micro-processor with suitable diagram. **(Ch 1, Q. 30)** 3

(c) Enlist six characteristics of Transmission Media. **(Ch 5, Q. 1(4))** 3

Q. 4(B) Solve any one of the following :

(a) The accumulator contains AA H and register C contains 55 H. What will be the contents of accumulator if following instructions are executed independently ? 4

(i) CMP C (ii) ANA C

(iii) ORA C (iv) SUB C **(Ch 2, Q. 47)**

(b) Compare any four features of 80486 and Pentium Processors. **(Ch 3, Q. 4, 5 & 6)** 4

Q. 5 Solve any two of the following :

(a) Write an Assembly Language Program to find absolute difference of two hex numbers stored in memory locations 5000H and 5001H. Store the result at 5002 H. **(Ch 2, Program 179)** 5

(b) Write an Assembly Language Program to find largest number in a block of memory starting from 7000 H. The length of the block is stored at 6FFF H. Store the result at the end of the block. **(Ch 2, Program 180)** 5

(c) Study the following program and answer the questions given below : 5

Label	Mnemonics/Operand
	MVI C, 08 H
	LXI H, 6000 H
	MOV A, M
BACK	RRC
	DCRC
	JNZ BACK
	INX H
	MOV M, A
	HLT

(i) Write the purpose of the program.

(ii) Write comments for the instructions used in the program.

(iii) If the input data at memory location 6000 H is FF H, then write the result along with corresponding memory location. **(Ch 2, Program 181)**

OR

Q. 5 Solve any two of the following :

(a) A block of data is stored in memory locations starting from 3001 H. The length of the block is at 3000 H. Write an Assembly Language Program that searches for the first occurrence of data AO H in given block. Store the address of this occurrence in HL pair. If the number is not found then HL pair should contain 0000 H. **(Ch 2, Program 182)** 5

(b) Write a Assembly Language Program to find sum of ten hex numbers stored in consecutive memory locations starting from 4000 H. Store the two byte result at the end of the block beginning with lower byte. **(Ch 2, Program 183)** 5

(c) Study the following program and answer the questions given below : 5

Label	Mnemonics/Operand	
	LXI H, COOO H	________
	MOV C, M	________
BACK	INX H	________
	MOV A, M	________
	XRA A	________
	MOV M, A	________
	DCR C	________
	JNZ BACK	________
	HLT	

(i) Write the purpose of the program.
(ii) Write comments for the instructions used in the program.
(iii) If the input data at memory location COOO H is 05 H, then write the result along with corresponding memory location. **(Ch 2, Program 184)**

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July 2019

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
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5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1(A) Select correct option and rewrite the following :

(a) The register in 8085 Microprocessor that keeps the track of the address of next executable instruction is ________. **1**
(i) Program Counter (ii) Stack Pointer
(iii) Program Status Word (iv) Instruction Register

(b) The PUSH PSW instruction of 8085 shall ________ the stack pointer. **1**
(i) Increment by two bytes (ii) Decrement by two bytes
(iii) Un affect (iv) None of these

(c) 8051 Microcontroller IC have ________ number of 8 bit I/O ports. **1**
(i) 1 (ii) 2 (iii) 4 (iv) 8

(d) The mobile phone uses ________ transmission technology. **1**
(i) Radio (ii) Microwave (iii) Infrared (iv) Satellite

Ans. : (a) (i) (b) (ii) (c) (iii) (d) (ii)

Q. 1(B) Solve any two of the following :

(a) Explain function of following pins of 8085 Microprocessor : **3**
(i) $\overline{WR}$ **(Ch. 1/Q. 9(iii))** (ii) HLDA **(Ch. 1/Q. 11(4))**
(iii) INTR **(Ch. 1/Q. 10(b))**

(b) Enlist three types of Hubs. Write its functions in one sentence. **(Ch. 5/Q. 39)** **3**

(c) What is Microcontroller ? Write any two of its advantages over Microprocessor. **(Ch. 4/Q. 2)** **3**

Q. 2(A) Answer any two of the following :

(a) Write any three functions which accumulator perform other than any other general purpose register in 8085 Microprocessor. **(Ch. 1/Q. 34)** 3

(b) Considering following points explain the given instruction. 3

Instruction : LHLD 16-bit address

(i) Group of Instruction (ii) Addressing Mode

(iii) Number of Bytes Required (iv) Flags Affected

(v) Explain with an example **(Ch. 2/Appendix I, (9))**

(c) State three expanded features of 8052 over 8051 Microcontroller. **(Ch. 4/Q. 9)** 3

Q. 2(B) Answer any one the following :

(a) Explain any four characteristics of Transmission Media. **(Ch. 5/Q. 4)** 4

(b) Accumulator contain data FFH and register B contain data 02H. Write the status of various flags and content of accumulator after execution of ADD B instruction. **(Ch. 2/Q. 185)** 4

Q. 3(A) Solve any two of the following :

(a) Write functions of following register of 8085 Microprocessor. 3

(i) Program Counter (ii) Stack Pointer

(iii) Temporary Register **(Ch. 1/Q. 34 & Q. 35)**

(b) Give any two examples of following addressing modes : 3

(i) Register Indirect Addressing Mode

(ii) Direct Addressing Mode

(iii) Immediate Addressing Mode **(Ch. 2/Q. 2)**

(c) What is meant by Protocol ? Explain concept of TCP/IP protocol. **(Ch. 5/Q. 36)** 3

Q. 3(B) Answer any one of the following :

(a) Explain STAR and RING Topologies with suitable diagram. **(Ch. 5/Q. 24 & Q. 25)** 4

(b) Explain with diagram memory register map of 8051 Microcontroller. **(Ch. 4/Q. 5)** 4

Q. 4(A) Answer any two of the following :

(a) Distinguish between Maskable and Non-maskable interrupts any three points. **(Ch. 1/Q. 27)** 3

(b) The flag register of 8085 microprocessor contain data 55H. Interpret its meaning. **(Ch. 2/Q. 186)** 3

(c) Distinguish between STP and UTP cables. (Any three points) **(Ch. 5/Q. 13)** 3

Q. 4(B) Answer any one of the following :

(a) Accumulator contain data ABH and register B contain data 55H. What will be the contents of accumulator after execution of each following instruction independently ? 4

(i) XRA B (ii) CMP B (iii) ADD B (iv) CMA

$A_{CC} = AB_H =$ 1010 1011

Reg B = 55H = 0101 0101 **(Ch. 2/Q. 187)**

(b) Explain advantages of following features of the Pentium Processor : 4

(i) Dual pipelining (ii) On-chip caches

(iii) Branch prediction (iv) 64 bit data bus **(Ch. 3/Q. 8)**

Q. 5 Answer any two of the following :

(a) Write an Assembly Language Program to double the contents of each memory location in the memory block stored from memory location 1220H to 1230H. Store the result at same memory location. **(Ch. 2/Program 106)** 5

(b) Write an Assembly Language Program to check whether the given 16 bit number stored in consecutive memory location beginning with lower byte 1200H is palindrome or not. If the number is palindrome then store FFH at 1210H memory location otherwise store OOH at same memory location. **(Ch. 2/Program 188)** 5

(c) Study the given program and answer the questions given below : **(Ch. 2/Program 189)** 5

Label	**Mnemonics/Operand**
	MVI B, 0A H
	LXI H, 2000 H
	MVI A, 01H
loop	MOV M, A
	INX H
	DCR B
	JZ stop
	ADI 02H
	JMP loop
stop	HLT

(i) Write the purpose of the program.

(ii) Write comments for each instructions used in the program.

(iii) Write the result along with their corresponding memory locations.

OR

Q. 5 Answer any two of the following :

(a) Write an Assembly Language Program for 8 bit number stored in memory location BABAH. Separate the two nibbles and multiply it. Store the result in memory location DADAH. **(Ch. 2/Program 190)** 5

(b) Write an Assembly Language Program to find the sum of series. Length of series is stored in memory location 1500H and series begins from memory location 1501H. Store the 16 bit sum from memory location 1600 H beginning with lower order byte. **(Ch. 2/Program 191)** 5

(c) Study the given program and answer the questions given below :

```
STC
CMC
LXI B, 1234H
MOV A, B
RAR
MOV H, A
MOV A, C
RAR
MOV L, A
HLT
```

(i) Write the purpose of the program. 2

(ii) Write contents of various registers used. 2

(iii) Write comments of various instructions used in the program. 1

(Ch. 2/Program 192)

□□□

March 2020

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
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5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1(A) Select correct option from the following and rewrite the sentences :

(a) ________ is non-maskable interrupt in 8085. 1

(i) RST 5.5 (ii) RST 6.5 (iii) RST 7.5 (iv) TRAP

(b) The length of instruction MVI reg. data is _______. 1

(i) 1 Byte (ii) 2 Byte (iii) 3 Byte (iv) 4 Byte

(c) The 8051 Micro-controller pan address ________ program memory. 1

(i) 8 k byte (ii) 16 k byte (iii) 32 k byte (iv) 64 k byte

(d) _______ cable is insensitive of EMI. 1

(i) Co-axial (ii) STP (iii) UTP (iv) Fiber Optic

Ans. : (a) (iv) (b) (ii) (c) (iv) (d) (iv)

Q. 1(B) Answer any two of the following :

(a) Write a note on evolution of Micro-processor. **(Ch. 1/Q. 2)** 3

(b) Explain any three addressing modes of 8085 Micro-processor with one example. **(Ch. 2/ Q. 3)** 3

(c) What is HUB ? Explain Active and Passive HUB. **(Ch. 5/Q. 39)** 3

Q. 2(A) Answer any two of the following :

(a) What is multiplexed BUS in 8085 ? Give its advantages. **(Ch. 1/Q. 18)** 3

(b) Explain following instruction of 8085 Micro-processor. 3

(i) CMA **(Ch. 2/Appendix III (17))**

(ii) RRC **(Ch. 2/ Appendix III (14))**

(iii) STC **(Ch. 2/ Appendix III (19))**

(c) Define Topology. Explain Physical and Logical Topology. **(Ch. 5/Q. 22)** 3

Q. 2(B) Answer any one the following :

(a) Define following registers of Micro-processor 8085. 4

(i) Accumulator **(Ch. 1/Q. 34(I))** (ii) STACK Pointer **(Ch. 1/Q. 35(b))**

(iii) Program Counter **(Ch. 1/Q. 35(d))** (iv) Instruction Register **(Ch. 1/Q. 35(c))**

(b) Explain following terms related to Pentium processor : 4

(i) Dual Pipeline (ii) Branch Prediction

(iii) On chip cache (iv) 64 bit data BUS **(Ch. 3/Q. 8)**

Q. 3(A) Answer any two of the following :

(a) Explain any three features of 8085 Micro-processor. **(Ch. 1/Q. 7)** 3

(b) Explain the function of following pins of 8085 Micro-processor : 3

(i) X1, X2 **(Ch. 1/Q. 17(i))** (ii) CLKOUT **(Ch. 1/Q. 16(3))** (iii) RD **(Ch. 1/Q. 9(ii))**

(c) List any six features of 8051 Micro-controller. **(Ch. 4/ Q. 3)** 3

Q. 3(B) Answer any one of the following :

(a) Explain memory map of 8051 Micro-controller. **(Ch. 4/Q. 5)** 4

(b) Explain Contention and Polling Access Methods. **(Ch. 5/Q. 34)** 4

Q. 4(A) Answer any two of the following :

(a) Flag register contain data C5H interpret its meaning. **(Ch. 2/Program 193)** 3

(b) The accumulator contain data 58H and register B contain data 07H. What will be the content of Accumulator after execution of following instruction independently : 3

(i) ADD B (ii) ORA B (iii) ANA B **(Ch. 2/Program 194)**

(c) Explain Co-axial Cable in detail. **(Ch. 5/Q. 8)** 3

Q. 4(B) Answer any one of the following :

(a) What is Interrupt ? List Hardware Interrupts according to Priority. Explain maskable and non-maskable in interrupts. **(Ch. 1/Q. 21, Q. 22, Q. 27 and Q. 28)** 4

(b) Explain the following characteristics of Transmission media : 4

(i) Installation Difficulties **(Ch. 5/Q. 5 and Q. 6)** (ii) EMI **(Ch. 5/Q. 4(d))**

(iii) Band Width **(Ch. 5/Q. 4(a))** (iv) Attenuation **(Ch. 5/Q. 4(c))**

Q. 5 Answer any two of the following :

(a) A block of data is stored from memory location D001H. Length of block is stored at D000H. Write a program to find occurrences of data 02H in given block. Store the number of occurrences at Memory Location D100H. **(Ch. 2/Program 195)** 5

(b) A block of data is stored from memory location D001H to D005H. copy the contents of block to another block starting from 2501H. **(Ch. 2/Program 196)** 5

(c) Write a program to subtract 3 Byte integer in register EHL from another 3 Byte integer in BCD. The result should be placed in BCD register keeping the integers in EHL undisturbed. **(Ch. 2/Program 197)** **OR** 5

Q. 5 Answer any two of the following :

(a) A block of data is stored in memory location from 3330H. Length of block is stored at 2FFFH. Write a program to find 2's compliment of each data in a block and store the result from memory location 4100H. **(Ch. 2/Program 198)** 5

(b) A block of data is stored from memory location C001H and length is stored in C000H. Write a program to find the sum of series and store the sum in CO50H and CO51H. **(Ch. 2/Program 199)** 5

(c) Write a program that divides two 1 byte hex number where the dividend is stored in 4060H and divisor in 406H stored the quotient and remainder in next two consecutive memory location respectively. **(Ch. 2/Program 200)** 5 ❑❑❑

December 2020

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
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	Total	04	04	12	36	06	24	06	30	94

Q. 1(A) Select correct option and rewrite the following :

(a) 'TRAP' interrupt of 8085 microprocessor transfers the control to ________ memory location. **1**

(i) 0024 H (ii) 0034 H (iii) 002C H (iv) 003C H

(b) The arithmetic instruction of 8085 microprocessor, which only affects carry flag is ________. **1**

(i) ADD B (ii) ADC D
(iii) DAD D (iv) None of these

(c) The 8051 Microcontroller has an ALU of ________ capacity. **1**

(i) 4 bit (ii) 8 bit
(iii) 16 bit (iv) None of these

(d) If the network is to be extended beyond predefined cable limit ________ is used. **1**

(i) Modem (ii) Hub
(iii) Router (iv) Repeater

Ans. : (a) (i) (b) (iii) (c) (ii) (d) (iv)

Q. 1(B) Solve any two of the following :

(a) Explain functions of the following pins of 8085 microprocessor : **3**

(i) $\overline{\text{RESET IN}}$ **(Ch. 1/Q. 10(c)/Pg. No. 1-9)**

(ii) ALE **(Ch. 1/Q. 9(i)/Pg. No. 1-9)**

(iii) READY **(Ch. 1/Q. 11(1)/Pg. No. 1-10)**

(b) List 'six' characteristics of transmission media. **(Ch. 5/Q. 1/Pg. No. 5-1)** **3**

(c) Compare 3 features of 8051 and 8052 microcontrollers. **(Ch. 4/Q. 8/Pg. No. 4-6)** **3**

Q. 2(A) Solve any two of the following :

(a) Define 'software interrupts'. Mention call locations of all software interrupts.
(Ch. 1/Q. 23/Pg. No. 1-15&16) 3

(b) Considering the following points explain the given instruction : 3

Instruction : ANI 8 bits

(i) Group of the Instruction (ii) Addressing mode

(iii) Number of bytes required (iv) Flags affected

(v) Explain with example **(Ch. 2/Appendix III - 3/Pg. No. 2-44)**

Ans. :

(i) Group of the Instruction : Logical

(ii) Addressing mode : Immediate

(iii) Number of bytes required : 2 Byte

(iv) Flags affected : S, Z, paremodified Cy = 0, Ac = 1.

(c) State any six characteristics of 8051 microcontroller. **(Ch. 4/Q. 3/Pg. No. 4-2)** 3

Q. 2(B) Solve any one the following :

(a) Draw the functional block diagram of 8085 microprocessor.
(Ch. 1/Q. 29/Pg. No. 1-18&19) 4

(b) Compare any four characteristics between Fibre Optic Cable and Twisted Pair Cable.
(Ch. 5/Q. 17&18/Pg. No. 5-11) 4

Ans. :

	Twisted Pair Cable	Coaxial Cable
(1)	It consists of a pair of wires or one or more pairs of two twisted copper wires insulation.	The light wave can be efficiently conducted through transparent glass fiber cables known as optic fiber cables. The centre conductor of this cable is a fibre that consists of highly refined glass or plastic.
(2)	This is inexpensive medium.	Relatively expensive and for installation it require skilled.
(3)	EMI effect is maximum.	This Cable has no sensitivity to EMI.
(4)	Attenuation is more than coaxial cable.	In fibre optical cable attenuation is very less.
(5)	Bandwidth capacity is from 1 to 100 Mbps upto 100 mtrs.	Optical fibre cable can transmit 100 mbps for several kilometers.
(6)	They can be used only for short distance communication.	It can be used runs over several kilometers.

Q. 3(A) Solve any two of the following :

(a) Write the function of the following blocks of 8085 microprocessor : 3

(i) Instruction Register **(Ch. 1/Q. 5(b)/Pg. No. 1-6)**

(ii) Stack Pointer **(Ch. 1/Q. 5(e)/Pg. No. 1-6)**

(iii) HL Register Pain **(Ch. 1/Q. 5(f)/Pg. No. 1-6)**

(b) Give any two instructions for each of the following addressing modes : 3
(i) Direct Addressing
(ii) Register addressing
(iii) Implicit addressing **(Ch.2/Q.2/Pg. No. 2-2)**

Ans. :

(i) Direct Addressing : LDA 2000H, LHLD D050H
(ii) Register addressing : ADD C, MOV B, A
(iii) Implicit addressing : CMA, STC

(c) Define 'Protocol'. Explain TCP/IP protocol. **(Ch. 5/Q. 36/Pg. No. 5-22)** 3

Q. 3(B) Solve any one of the following :

(a) What is Modem ? List the types of Modem. Explain it's working with diagram.
(Ch. 5/Q. 37&38/Pg. No. 5-22&23) 4

(b) Explain with diagram memory map of 8051 microcontroller. **(Ch. 4/Q. 5/Pg. No. 4-4)** 4

Q. 4(A) Solve any two of the following :

(a) The flag register of 8085 microprocessor contain the data 54H. Interpret its meaning. 3

Ans. : (Chp. 1)

Flag reg = 54H = 01010100

Flag =	S	Z	–	AC	–	P	–	Cy
54H =	0	1	0	1	0	1	0	0

S = 0 = Reset = Accumulator content is positive no.
Z = 1 = Set = Accumulator content means result is zero.
AC = 1 = Set = In accumulator content carry is generated from D3 to DH.
P = 1 = Set = In accumulator content even no. of 1's present.
Cy = 0 = Reset = In accumulator content no extra bit generated.

(b) Draw and label programming model of 8085 microprocessor. List the valid register pairs. **(Ch. 1/Q. 32/Pg. No. 1-21)** 3

(c) Explain with diagram 'BUS topology'. Mention it's two advantages and two disadvantages. **(Ch. 5/Q. 23/Pg. No. 5-14)** 3

Q. 4(B) Solve any one of the following :

(a) The contents of the Accumulator is FF H and Register 'C' is 01 H. Find the result of the following instructions executed independently : 4
(i) XRA A (ii) ADD C (iii) MOV A, C (iv) CMP C

Ans. : (Chp. 2)

(i) XRA A : FEH
(ii) ADD C : 00H Cy = 01H
(iii) MOV A, C : A = 01H
(iv) CMP C : A = FEH Cy = 00H

(b) Draw neat labeled diagram of the programming model of 16 bit version of X-86 family.
(Ch. 3/Q. 13/Pg. No. 3-8) 4

Q. 5 Answer any two of the following :

(a) Write an Assembly Language Program to count data D9H in a block of 10 memory locations starting from C020 H Store the result at CO50 H.
(Ch. 2/Program 201/Pg. No. 2-172) 5

(b) Write an Assembly Language Program to exchange a block of 15 memory locations starting from D040 with another block starting from D050 H.
(Ch. 2/Program 202/Pg. No. 2-173) 5

(c) Study the program and answer the questions given below : 5

Label	Mnemonics
	LXI H, CO2FH
	MOV A, M
	MVI D, 00 H
	MVI B, 08 H
Back	RRC
	JNC GO
	INR D
Go	DCR B
	JNZ back
	INX H
	MOV M, D
	HLT

(i) Write the comments of the each instruction of the program.
(ii) Write the purpose of the program.
(iii) Input data stored at CO2F H is D7 H, Write the address of the memory location where the result is stored. Also write the resultant data.
(Ch. 2/Program 203/Pg. No. 2-173 & 174)

OR

Q. 5 Answer any two of the following :

(a) Write an Assembly Language Program to multiply two, one byte numbers stored at 3050 H and 3051 H. Store the result in the next two consecutive memory locations beginning with lower byte. **(Ch. 2/Program 204/Pg. No. 2-174)** 5

(b) Write an Assembly Language Program to find 2's complement of one byte number stored from memory locations C030 H to C039. Store the result from C040 H to C049 H respectively. **(Ch. 2/Program 205/Pg. No. 2-175)** 5

(c) Study the program and answer the questions given below : 5

	Mnemonics
	LXI H, 1200 H
	MOV A, B
	MOV B, M
	RLC
	RLC
	RLC
	RLC
	ADD B
	INX H
	MOV M, A
	HLT

(i) Write the comments of the each instructions of the program.

(ii) Write the purpose of the program.

(iii) Input data stored at 1200 H is 4A H. Write the address of the memory location where the result is stored.
Also write the resultant data. **(Ch. 2/Program 206/Pg. No. 2-175 & 176)**

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October 2021

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	04	12	02	08	–	–	21
2	Instruction Set and Programming of 8085	01	01	04	12	–	–	06	30	43
3	Introduction to INTEL X-86 Family	01	01	–	–	01	04	–	–	05
4	Introduction of Microcontroller	–	–	01	03	01	04	–	–	07
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1(A) Select the correct alternative and rewrite the following :

(i) The instruction MOV M , C has __________ addressing mode. 1

(a) register (b) direct
(c) register indirect (d) implicit / implied

(ii) __________ flag bit is reset when flag register content is D4H. 1

(a) S (b) Z
(c) CY (d) AC

(iii) The maximum physical memory can be addressed by 8086 microprocessor is __________. 1

(a) 4 GB (b) 16 MB
(c) 1 MB (d) 1 KB

(iv) __________ is the most economical cable used in computer network. 1

(a) UTP (b) STP
(c) Fiber optic (d) Thicknet coaxial cable

Ans. : (i) (c) (ii) (c) (iii) (c) (iv) (c)

Q. 1(B) Answer any two of the followings :

(i) Explain any six features of 8085 microprocessor? **(Ch. 1/Q. 7/Pg. No. 1-8)** 3

(ii) Explain the following instructions of 8085 microprocessor with example :

(a) ANA r **(Ch. 2/Appendix III - 1/Pg. No. 2-43)**

(b) PCHL **(Ch. 2/Appendix III - 8/Pg. No. 2-54)**

(c) LXI rp , 16 bit data / address **(Ch. 2/Appendix I - 6/Pg. No. 2-32)** 3

(iii) Explain any three characteristics of fiber optic cable. **(Ch. 5/Q. 14(9)/Pg. No. 5-10)** 3

Q. 2(A) Answer any two of the followings :

(i) Compare the features of 8051 and 8052 microcontrollers? **(Ch. 4/Q. 8/Pg. No. 4-6)** 3

(ii) Explain the following pins of 8085 microprocessor : 3

(a) ALE **(Ch. 1/Q. 9(i)/Pg. No. 1-9)**

(b) INTR **(Ch. 1/Q. 10(b)/Pg. No. 1-9)**

(c) READY **(Ch. 1/Q. 11(1)/Pg. No. 1-10)**

(iii) What are branching instruction? Enlist any four conditional branch instructions of 8085 microprocessor? **(Ch. 2/Q. 10/Pg. No. 2-7)** 3

Q. 2(B) Answer any one of the followings :

(i) The flag register of 8085 microprocessor contains data 1BH. Interpret's It's meaning? **(Ch. 1/Q. 50/Pg. No. 1-29)** 4

Ans. : Flag Reg : 1B = 0001 1011

Flag Reg :	=	S	Z	–	AC	–	P	–	Cy
1B	=	0	0	0	1	1	0	1	1

S = 0 = Reset = Accumulator content is positive no.

Z = 0 = Reset = Accumulator content is not zero mean result is not zero.

AC = 1 = Set = In accumulator content carry is generated from D3 to D4.

P = 0 = Reset = In accumulator content odd no. of 1's present.

Cy = 1 = Set = In accumulator content extra bit generated.

(ii) Explain the programming model of 16 bit version of X86 family with suitable diagram? **(Ch. 3/Q. 13/Pg. No. 3-8)** 4

Q. 3(A) Answer any two of the followings :

(i) Explain the following network access methods in brief :

(a) Contention (b) Token passing **(Ch. 5/Q. 34/Pg. No. 5-20)** 3

(ii) Explain the organization of ALU of 8085 microprocessor with the suitable diagram? **(Ch. 1/Q. 31/Pg. No. 1-20)** 3

(iii) Explain the following addressing modes of 8085 microprocessor with suitable example :

(a) Register Indirect (b) Implicit / Implied **(Ch. 2/Q. 2(iv&v)/Pg. No. 2-2)** 3

Q. 3(B) Answer any one of the followings :

(i) Explain memory map of 8051 microcontroller with suitable diagram? **(Ch. 4/Q. 5/Pg. No. 4-4)** 4

(ii) What is bandwidth? Write any three difference points between base band and broad band? **(Ch. 5/Q. 4(a), Q. 4(b), Q. 6(iv)/Pg. No. 5-2)** 4

Q. 4(A) Answer any two of the followings :

(i) The accumulator of 8085 microprocessor contains data 52H and register C contains data 78H. What will be the content of accumulator after execution of following instructions independently: **3**

(a) SUB C

(b) CMA

(c) XRI 29H

Ans. : (Chp. 2)

(a) SUB C : DAH, Cy = 01H

(b) CMA : ADH

(c) XRI 29H : 7BH

(ii) Differentiate between maskable and nonmaskable interrupts of 8085 μP? **(Ch. 1/Q. 27/Pg. No. 1-17)** **3**

(iii) What is ROUTER? Explain its type in detail? **(Ch. 5/Q. 40/Pg. No. 5-25)** **3**

Q. 4(B) Answer any one of the followings :

(i) What do you mean by BUS in 8085 is μP? Explain it's types in detail? **(Ch. 1/Q. 6/Pg. No. 1-7)** **4**

(ii) What is protocol? Explain TCP/IP protocol in detail? **(Ch. 5/Q. 36/Pg. No. 5-22)** **4**

Q. 5 Solves any two of the followings :

(i) Write an ALP to separate nibbles of a data byte stored at memory location C050H. Stores the separated nibbles in register B and C respectively. **(Ch. 2/Program 207/Pg. No. 2-176)** **5**

(ii) Write an ALP to find the sum of odd numbers in a block of data stores from memory location C030H to C037H. Stores the sum at memory location C038H. **(Ch. 2/Program 208/Pg. No. 2-176 & 177)** **5**

(iii) Write an ALP to copy a block of data from C050H to C054H to another block of data starting from C060H to C064H in reverse order. **(Ch. 2/Program 209/Pg. No. 2-177)** **5**

OR

Q. 5 Solves any two of the followings :

(i) Write an ALP to count the number of occurrences of data A4H in a block of memory locations starting from memory location C051H. The length of block is stored at memory location C050H. Store result at the end of block. **(Ch. 2/Program 210/Pg. No. 2-177 & 178)** **5**

(ii) Write an ALP to shift a 16 bit data towards left by 1 bit. The 16 bit data is stored at memory location C050H and C051H. Stores result in C052H and C053H. **(Ch. 2/Program 211/Pg. No. 2-178)** **5**

(iii) Write an ALP to divide two 8 bit numbers. The dividend is stored at Memory location C001H and Divisor is stored at memory location C002H. Stores the quotient at memory location C003H and remainder at memory Location C004H. **(Ch. 2/Program 212/Pg. No. 2-178)** **5**

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March 2022

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	04	12	02	08	–	–	21
2	Instruction Set and Programming of 8085	01	01	04	12	–	–	06	30	43
3	Introduction to INTEL X-86 Family	–	–	01	03	–	–	–	–	03
4	Introduction of Microcontroller	01	01	01	03	01	04	–	–	08
5	Networking Technology	01	01	02	06	03	12	–	–	19
	Total	04	04	12	36	06	24	06	30	94

Q. 1(A) Select the correct alternative and rewrite the following :

(a) 8085 microprocessor consist of ________ general purpose registers. 1
(i) 4 (ii) 6 (iii) 8 (iv) 16

(b) ________ is not an example of logical operation of 8085 Microprocessor. 1
(i) Rotate (ii) Complement
(iii) Increment (iv) Compare

(c) 8051 is a ________ bit microcontroller. 1
(i) 4 (ii) 8 (iii) 32 (iv) 16

(d) Bandwidth of telephone line is ________. 1
(i) 3 to 4 KHz (ii) 30 to 40 KHz
(iii) 10 to 100 KHz (iv) 50 to 80 KHz

Ans. : (a) (ii) (b) (iii) (c) (ii) (d) (i)

Q. 1(B) Answer any two of the following :

(a) Explain following registers of 8085 Microprocessor : 3
(i) Instruction Decoder **(Ch. 1/Q. 5(iii)/Pg. No. 1-7)**
(ii) Temporary Register **(Ch. 1/Q. 34(ii)/Pg. No. 1-22)**
(iii) Stack Pointer **(Ch. 1/Q. 5(ii) - (e)/Pg. No. 1-6)**

(b) What do you mean by Interrupt ? Explain Software Interrupt.
(Ch. 1/Q. 21(1),(4),(5),(6), 23(1),(2)(3)(7), 24(2)/Pg. No. 1-14,15,16) 3

(c) Explain the programming model for 32-bit version of x-86 family with suitable diagram.
(Ch. 3/Q. 12/Pg. No. 3-7,8) 3

Q. 2(A) Answer any two of the following :

(a) Compare Microcontroller with Microprocessor. **(Ch. 4/Q. 11/Pg. No. 4-7)** 3

(b) What do you mean by Modem ? Explain its types. **(Ch. 5/Q. 37,38/Pg. No. 5-22,23)** 3

(c) Explain following pin's of 8085 Microprocessor : 3

(i) SID **(Ch. 1/Q. 1(B)(i)/Pg. No. 1-10)**

(ii) HOLD **(Ch. 1/Q. 10(i)/Pg. No. 1-9)**

(iii) $IO/\overline{M}$ **(Ch. 1/Q. 15(i)/Pg. No. 1-11)**

Q. 2(B) Answer any one the following :

(a) What do you mean by Flag Register ? Explain it bit pattern by giving an example. **(Ch. 1/Q. 39 & Q.44/Pg. No. 1-24, 1-27)** 4

(b) Explain any four characteristics of Co-axial cable. **(Ch. 5/Q. 9/Pg. No. 5-6)** 4

Q. 3(A) Answer any two of the following :

(a) Explain following instructions of 8085 Microprocessor. **(Incomplit Question by Board)** 3

(b) Explain following addressing modes of 8085 Microprocessor : 3

(i) Immediate Addressing **(Ch. 2/Q. 2(iii)/Pg. No. 2-2)**

(ii) Register Indirect Addressing **(Ch. 2/Q. 2(iv)/Pg. No. 2-2)**

(iii) Direct Addressing **(Ch. 2/Q. 2(i)/Pg. No. 2-2)**

(c) The Accumulator contains the data 76H and the register I, contains the data A6H. What will be the contents of accumulator in hex after execution of each of the following instruction independently : 3

(i) ORA L (ii) ANA L (iii) RRC

Ans. : (Chp. 2)

(i) ORA L : A = F6H

(ii) ANA L : A = 26H

(iii) RRC : A = 3BH Cy = 00H

Q. 3(B) Answer any one of the following :

(a) Compare the characteristics of UTP Cable and STP Cable. **(Ch. 5/Q. 13/Pg. No. 5-9)** 4

(b) Flag Register contains data D9H. Interpret its meaning. **(Ch. 1/Q. 52/Pg. No. 1-29,30)** 4

Q. 4(A) Answer any two of the following :

(a) Write the addressing mode of following instructions : 3

(i) RAL (ii) STA C500 H

(iii) ADD C (iv) MVI B, 55H

(v) MOV M, A (vi) INR A

Ans. : (Chp. 2)

(i) RAL - Implied

(ii) STA C500 H - Direct

(iii) ADD C - Register

(iv) MVI B, 55H - Immediate

(v) MOV M, A - Register Indirect

(vi) INR A - Register

(b) What is Microprocessor ? Write features of 8085 Microprocessor. **(Ch. 1/Q. 1 & 7/Pg. No. 1-1 & 1-8)** 3

(c) Explain LAN, WAN and MAN. **(Ch. 5/Q. 7 & 8/Pg. No. 5-4,5)** 3

Ans. :

LAN	MAN	WAN
LAN stands for local area network.	MAN stands for metropolitan area network.	WAN stands for wide area network.
Operates in small areas such as the same building or campus.	Operates in large areas such as a city.	Operates in large areas such as country or continent.
LAN's ownership is private.	MAN's ownership can be private or public.	While WAN also might not be owned by one organization.
The transmission of a LAN is high.	While transmission speed of a MAN is average.	Whereas transmission speed of a WAN is low.
LAN's design and maintenance are easy.	While MAN's design and maintenance are difficult than LAN.	Whereas WAN's design and maintenance are also difficult than LAN as well MAN.
There is more fault tolerance in LAN.	While there is less fault tolerance.	In WAN, there is also less fault tolerance.

Q. 4(B) Answer any one of the following :

(a) Explain any four advantages and four application of Microcontroller. **(Ch. 4/Q. 2 & Q.10/Pg. No. 4-2 & 4-6)** 4

(b) Explain Repeater and Router. **(Ch. 5/Q. 39(ii) & Q.40/Pg. No. 5-24,25)** 4

Q. 5 Answer any two of the following :

(a) A block of data is stored in memory location from C101H to C10AH. Write an Assembly Language Program to transfer the block in reverse order to memory location C200H and onward. **(Ch. 2/Program 213/Pg. No. 2-179)** 5

(b) Write an Assembly Language Program to find the product of two numbers stored in memory location C005H and C006H. Store the result in C000H and C001H. **(Ch. 2/Program 214/Pg. No. 2-179)** 5

(c) Write an Assembly Language Program to add two BCD number stored an location 2500H and 2501H. Place the BCD result in location 2502H and onward starting with LSB. **(Ch. 2/Program 215/Pg. No. 2-179 & 180)** 5

OR

Q. 5 Answer any two of the following :

(a) Write a subroutine to fill the memory location 2501H to 25FF H with Hex number 01H to FFH. **(Ch. 2/Program 216/Pg. No. 2-180)** 5

(b) A Hex number is stored at location 2100H. Write an Assembly Language Program to interchange its digit, the new number is to be stored in 2105H. Add original number with new number and store the result at location 2105H. **(Ch. 2/Program 217/Pg. No. 2-180 & 181)** 5

(c) Write an ALP to count the number of odd data byte occurring in a block, starting from memory location 2501H to 25FFH. Store the result at the memory location 2600H. **(Ch. 2/Program 218/Pg. No. 2-181)** 5

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July 2022

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	04	12	02	08	–	–	21
2	Instruction Set and Programming of 8085	01	01	04	12	–	–	06	30	43
3	Introduction to INTEL X-86 Family	–	–	–	–	01	04	–	–	04
4	Introduction of Microcontroller	01	01	01	03	01	04	–	–	08
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1(A) Select the correct option from the following and rewrite the sentence :

(a) ________ in a Micro-controller chip. 1

(i) 8050 (ii) 8086 (iii) 8051 (iv) 8080

(b) The Micro-processor 8088 is a ________ bit processor. 1

(i) 8 bit (ii) 16 bit (iii) 12 bit (iv) 64 bit

(c) ________ cable has largest bandwidth. 1

(i) UTP (ii) STP

(iii) Co-axial (iv) Fibre Optics

(d) LXI H. addr is ________ byte instruction.

(i) 1 (ii) 2 (iii) 3 (iv) None of these

Ans. : (a) (iii) (b) (ii) (c) (iv) (d) (iii)

Q. 1(B) Answer any two of the following :

(a) Draw a functional pin diagram of 8085 Micro-processor. **(Ch. 1/Q. 8/Pg. No. 1-8)** 3

(b) What are the different addressing modes used in 8085 Micro-processor ? Explain any two of their with suitable examples. **(Ch. 2/Q. 2/Pg. No. 2-2)** 3

(c) Compare UTP and Fibre Optic Cable with three attributes. **(Ch. 5/Q. 15/Pg. No. 5-10)** 3

Q. 2(A) Answer any two of the following :

(a) State any 3 addressing modes of 8085 with examples. **(Ch. 2/Q. 2/Pg. No. 2-2)** 3

(b) Explain the purpose of the following instruction in 8085 Micro-processor. 3

(i) LDAX B **(Ch. 2/Appendix (11)/Pg. No. 2-34)**

(ii) SHLD 2500H **(Ch. 2/Appendix (10)/Pg. No. 2-34)**

(iii) XTHL **(Ch. 2/Appendix (5)/Pg. No. 2-57)**

(c) What is Topology ? Explain BUS Topology in detail. **(Ch. 5/Q. 23/Pg. No. 5-14)** 3

Q. 2(B) Answer any one :

(a) Define the following registers of Micro-processor 8085 : 4

(i) Temporary Register **(Ch. 1/Q. 34/Pg. No. 1-22)**

(ii) Stack Pointer **(Ch. 1/Q. 5(e)/Pg. No. 1-6)**

(iii) Instruction Register **(Ch. 1/Q. 5(b)/Pg. No. 1-6)**

(iv) Instruction Decoder **(Ch. 1/Q. 5(iii)/Pg. No. 1-7)**

(b) Explain the programming model of 32-bit version of X-86 family.
(Ch. 3/Q. 12/Pg. No. 3-7) 4

Q. 3(A) Answer any two of the following :

(a) The flag register of 8085 Micro-processor contains the data CD H. Interpret it's meaning. 3

Ans. :

Flag Reg CD = 1100 1101

S	Z	X	AC	X	P	X	Cy
1	1	0	0	1	1	0	1

S = 1 = set = No –ve

Z = 1 = set = Result zero.

AC = 0 = reset = D_3 to D_4 carry not generate.

P = 1 = set = even no. of 1's present

Cy = 1 = set = extra bit generated

(b) Explain the functions of following pins of 8085 Micro-processor : 3

(i) S_0 and S_1 **(Ch. 1/Q. 11/Pg. No. 1-10)**

(ii) ALE **(Ch. 1/Q. 9/Pg. No. 1-9)**

(iii) $\overline{\text{INT A}}$ **(Ch. 1/Q. 16/Pg. No. 1-11)**

(c) Write any six features of 8051 Micro-controller. **(Ch. 4/Q. 3/Pg. No. 4-2)** 3

Q. 3(B) Answer any onc of the following :

(a) Explain various applications of Micro-controller. **(Ch. 4/Q. 10/Pg. No. 4-6)** 4

(b) Write a short note on shielded twisted pair cable with it's characteristics.
(Ch. 5/Q. 11/Pg. No. 5-7 and 8) 4

Q. 4(A) Answer any two of the following :

(a) Define the following terms : 3

(i) T-state

(ii) Machine Cycle

(iii) Instruction Cycle **(Ch. 1/Q. 55/Pg. No. 1-31)**

(b) Accumulator contains the data 66H and register E contains the data 22H. Write the content of accumulator after stepwise execution of the following instruction : 3

(i) ADD E

(ii) CMA

(iii) RRC

Ans. :

(i) ADD E = 88H

(ii) CMA = 77H

(iii) RRC = BBH

(c) Explain in short the six important characteristics of Transmission Media.
(Ch. 5/Q. 6/Pg. No. 5-2) **3**

Q. 4(B) Answer any one of the following :

(a) Draw neat labelled block diagram of internal architecture of 8085 Micro-processor.
(Ch. 1/Q. 29/Pg. No. 1-19) **4**

(b) Write the functions of each of the following devices in short : **4**

(i) Modern

(ii) Hub

(iii) Repeater

(iv) Router **(Ch. 5/Q. 41/Pg. No. 5-25)**

Q. 5 Answer any two of the following :

(a) A series of numbers are stored in memory block from 2001H to 2010H. Write an Assembly Language Program to find the largest number from the given series and store the largest number at the end of the block. **5**

Ans. :

Label	Mnemonics	Comments
	LXI H, 2000 H	; Set H-L pair to 2000 H
	MOV C, M	; Set counter
	MVI A, OOH	; Set largest = OO H
BACK	INX H	; Increment H-L pair
	CMP M	; Compare no in memory with no in ACC
	JNC AHEAD	; If no in ACC is larger, jump to AHEAD
	MOV A, M	; Move larger no in ACC
AHEAD	DCR C	; Decrement counter
	JNZ BACK	; Repeat if counter≠0
	INX H	; Increment H-L pair
	MOV M, A	; Store largest number at the end of block
	HLT	; Stop

(b) The length of block is stored in memory contain 3000H and the block itself begins from memory contains 3001 H. Write an Assembly Language Program to count the number of even data bytes present in the given block. Store the count at memory location contain 3232H. **5**

Ans. :

Label	Mnemonics	Comments
	LXI H, 3000H	; Initialize the first memory location
	MVI C, M	; Initialize reg. C as location counter
	MVI B, 00 H	; Initialize reg. B to store even byte counter
	INX H	; Increment memory location
REPEAT	MOV A, M	; Get the memory content in accumulator
	RRC	; Take bit D_0 of accumulator in C_y flag position
	JC NEXT	; If not even jump to the label "NEXT"
	INR B	; Update the value of even byte counter
NEXT	INX H	; Get the next memory location
	DCR C	; Decrement location counter by 1
	JNZ REPEAT	; If counter ≠ 0, jump to the label "REPEAT"
	MOV A, B	; copy even byte count value in accumulator
	STA 3232H	; Store even byte count at address 9500H
	HLT	; Stop the processing

(c) Write an Assembly Language Program to exchange two hexadecimal digits of a number stored at memory location 4000H. ADD exchange number With original number store the result at memory location 4001H. 5

Ans. :

Label	Mnemonics	Comments
	LXI H, 4000H	; Load HL pair with 4000H
	MOV A, M	; Move number in Acc.
	RRC	; Rotate right one bit four times for nibble exchange
	RRC	
	RRC	
	RRC	
	ADD M	; Add original number with exchange
	STA 4001H	; Store result in 40001H
	HLT	; Stop

OR

Q. 5 Answer any two of the following :

(a) Write an Assembly Language Program to count the number of 1's and 0's in a 8 bit binary number stored at memory location 5000OH. Store the count for 0's and 1's in a memory location 5001H and 5002H respectively. 5

Ans. :

Label	Mnemonics+ operand	Comments
START	LXI H, 0000H	; Clear H-L pair
	LDA 5000H	; Get number in accumulator
	MOV C, 08	; Initialize counter
NEXT	RRC	; Rotate acc to check a bit
	JNC SKIP	; If bit is zero, goto SKIP
	INR L	; Increment count since bit is 1
SKIP	DCR C	; Decrement counter
	JNZ NEXT	; Repeat if counter □ 0
	MVI A, 08	; Initialize acc
	SUB L	; Subtract count of 1 bit
	MOV H, A	; Take count of num of O bit
	SHLD 5001H	; Store result
	HLT	; Stop processing

(b) Write an Assembly Language Program to multiply two digit hexadecimal number stored in the memory location 6001H with another two digit hexadecimal number stored in memory location contain 6002H. Store the product in memory location 6005H and 6006H. **5**

Ans. :

Label	Mnemonics Operand	Comments
	XRA A	; Initialize accumulator with 00H
	MOV B, A	; Initialize register B with 00H
	LXI H, 6001H	; Initialize H-L Pointer to address 6001H
	MOV C, M	; Get first number in register C
	INX H	; Get address of second number in H-L pair
VY	ADD M	; Add two numbers
	JNC XX	; Is carry ? No – Jump to label XX
	INR B	; Increment count in register B by 1 to store MSB
XX	DCR C	; Decrement count in register by 1
	JNZ YY	; Is zero? No – Jump to label yy
	STA 6005H	; If yes, store LSB of product at 6005H
	MOV A, B	; Get MSB in register A
	STA 6006H	; Store MSB of product at 6006H
	HLT	; Stop processing

(c) Write an Assembly Language Program to fill up the 20 memory locations storing from 7000H with a data type 00H and FFH at every alternate memory location. **5**

Ans. :

Label	Mnemonics+ Operand	Comments
START	MVI C, 13 H	; Initialize counter
	MVI D, 00H	; Move 00 to D register
	MVI E, FFH	; Move FF to E register
	LXI H, 7000H	; Initialize pointer
UP	MOV M, D	; Fill 00 in memory location
	DCR C	; Decrement count
	INX H	; Increment pointer
	MOV M, E	; Fill FF to next memory location
	INX H	; Increment pointer
	DCR C	; Decrement count
	JNZ UP	; Check if counter ≠ 0 repeat
	HLT	; Stop processing

OR

Label	Mnemonics+ Operand	Comments
START	MVI C, 13 H	; Initialize counter
	LXI H, 7000H	; Initialize pointer
UP	MOV A, L	; Get contents of register L in ACC
	ANI 01 H	; mask bit 1 to bit 7
	JNZ ODD	; Jump if odd memory location num.
	MVI M, 00 H	; Fill 00 H in memory
	JMP LOOP	; Goto Loop
ODD	MVI M, FF	; Fill FFH in memory.
LOOP	INX H	; Increment pointer
	DCR C	; Decrement counter
	JNZ UP	; Check if counter ≠ 0 repeat
	HLT	; Stop processing

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March 2023

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	04	12	01	04	–	–	17
2	Instruction Set and Programming of 8085	01	01	02	06	02	08	06	30	45
3	Introduction to INTEL X-86 Family	–	–	01	03	01	04	–	–	07
4	Introduction of Microcontroller	01	01	02	06	–	–	–	–	07
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1(A) Select the correct alternative and rewrite the following :

(a) Zero flag is not affected in ________ instruction. **1**

(i) XRA A (ii) SUB A

(iii) CMP A (iv) MVI A, OOH

(b) The interrupt ________ is not a vectored. **1**

(i) INTR (ii) TRAP

(iii) RST 7.5 (iv) RST 6.5

(c) The most expensive cable amongst the following is ________. **1**

(i) UTP (ii) Fiber Optic

(iii) Co-axial (iv) STP

(d) The internal ROM of 8051 is ________. **1**

(i) 2 KB (ii) 8 KB

(iii) 4 KB (iv) 16 KB

Ans. : (a) (iv) (b) (i) (c) (ii) (d) (iii)

Q. 1(B) Answer any two of the following :

(a) Write any two instructions of 8085 microprocessor for each of the following : **(Ch. 2/Q. 7/Pg. No. 2-5)** **3**

(i) 1 byte (ii) 2 bytes (iii) 3 bytes

Ans. :

(i) 1 byte : MOV, CMA, RRC, RLC, HLT, CMC, STC, MOV M, A, etc.

(ii) 2 bytes : MVI A, 02 H, ADI 00H, ACI 01 H, etc.

(iii) 3 bytes : LXI H, 2000 H, LDA 7000 H, STA 2500 H, SHLD 2500 H, etc.

(b) Explain the following characteristics of transmission media : **3**

(i) Cost of Media

(ii) Electromagnetic interference

(iii) Band width **(Ch. 5/Q. 5/Pg. No. 5-3)**

(c) Write the following points for the instruction LDAX B in 8085 Microprocessor : **3**

(i) Interpretation of Mnemonic

(ii) Addressing mode

(iii) Number of byte(S)

Ans. :

(i) Interpretation of Mnemonic **(Ch. 2/Appendix I (ii)/Pg. No. 2-34 and 2-35)**

(ii) Addressing mode : Register Indirect

(iii) Number of byte(S) : 1 Byte

Q. 2(A) Answer any two of the following :

(a) Write a short note on Co-axial Cable. **(Ch. 5/Q. 8/Pg. No. 5-5)** **3**

(b) Write the function of following pins in 8085 Microprocessor : **3**

(i) $\overline{\text{WR}}$ **(Ch. 1/Q. 9 (iii)/Pg. No. 1-9)**

(ii) $\overline{\text{RESETIN}}$ **(Ch. 1/Q. 10 (c)/Pg. No. 1-9)**

(iii) READY **(Ch. 1/Q. 11 (1)/Pg. No. 1-10)**

(c) Write the difference between LAN and WAN. (Any three points)
(Ch. 5/Q. 7/Pg. No. 5-5) **3**

Q. 2(B) Answer any one the following :

(a) If Accumulation contains AA H and register B contains 55 H, write the contents of Accumulator in hexadecimal after execution of each of the following instruction dependently (one after another) : **(Ch. 2)** **4**

(i) ORA, B (ii) CMA (iii) ADI, FFH (iv) INR A

Ans. :

(i) ORA, B = FFH

(ii) CMA = OOH

(iii) ADI, FFH = FFH

(iv) INR A = OOH (Cy = Not affected)

(b) Write a short note on 'Modem'. **(Ch. 5/Q. 37/Pg. No. 5-32)** **4**

Q. 3(A) Answer any two of the following :

(a) Write ROM and RAM size of the following Microcontrollers : **(Ch. 4/Q. 7/Pg. No. 4-5)** **3**

(i) 8050 (ii) 8051 (iii) 8052

Ans. :

		RAM	ROM
(i)	8050	256 byte	4 Kbyte
(ii)	8051	128 byte	4 Kbyte
(iii)	8052	256 byte	8 Kbyte

(b) If the contents of Accumulator is FFH. Write the status of zero flag, Auxillary carry flag and carry flag after the execution of instruction INR A in 8085 Microprocessor. **(Ch. 1)** **3**

Ans. :

Zero flag = 01 H
= Set

Auxillary = 01 H = Set

Carry flag = Not affected

(c) Compare 80286 and 80486 processors on the following attributes : **3**

(i) Data bus

(ii) Address bus

(iii) Physical memory size

Ans. :

		80286	80486
(i)	Data bus	16 bit	32 bit
(ii)	Address bus	24 bit	32 bit
(iii)	Physical memory size	16 Mbyte	4 Gbyte

Q. 3(B) Answer any one of the following :

(a) Write any two instruction of the following four group : **5**

(i) Logical group **(Ch. 2/Appendix - 3/Pg. No. 2-43 to 2-51)**

(ii) Data transfer group **(Ch. 2/Appendix - 1/Pg. No. 2-31 to 2-35)**

(iii) Arithmetic group **(Ch. 2/Appendix - 2/Pg. No. 2-35 to 2-43)**

(iv) Branching group **(Ch. 2/Appendix - 4/Pg. No. 2-52 to 2-57)**

(b) Draw and label the programming model of 80486 processor. **(Ch. 3/Q. 12/Pg. No. 3-7)** **4**

Q. 4(A) Answer any two of the following :

(a) Write any three points which specifies Accumulator of 8085 microprocessor as a special purpose register. **(Ch. 1/Q. 34/Pg. No. 1-22)** **3**

(b) Write any six features of 8051 Microcontroller. **(Ch. 4/Q. 3/Pg. No. 4-2)** **3**

(c) Answer the following with respect to hardware interrupts of 8085 Microprocessor : **3**

(i) List all interrupts **(Ch. 1/Q. 26/Pg. No. 1-17)**

(ii) Specify the highest and lowest priority interrupt **(Ch. 1/Q. 28/Pg. No. 1-18)**

(iii) Specify whether maskable or Non-maskable interrupt. **(Ch. 1/Q. 28/Pg. No. 1-18)**

Q. 4(B) Answer any one of the following :

(a) Draw block diagram of internal architecture of 8085 Microprocessor. **(Ch. 1/Q. 29/Pg. No. 1-19)** **4**

(b) Write a short note on STAR topology using following points : **4**

(i) Definition

(ii) Diagram

(iii) Advantages

(iv) Disadvantages **(Ch. 5/Q. 25/Pg. No. 5-16)**

Q. 5 Answer any two of the following :

(a) Write an Assembly Language Program to count number of zeros in a number stored at memory location 2600H. Store the count at 2601H. 5

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI H, 2600H	; Initialize H-L pair with address of number
	MOV B, M	; Get number in B register
	MVI C, 00H	; Initialize register C to store count of zeros.
	MVI E, 08H	; Initialize register E to store counter for 8-bit number.
Loop	MOV A, B	; Transfer the 8-bit number into accumulator
	RLC	; Rotate content of accumulator left side by one bit to check the bit.
	MOV B, A	; Store the rotated data in register B.
	JC DOWN	; If carry ? Yes, jump to DOWN
	INR C	; Increment register C contents by 1 if there is no carry means bit is zero
DOWN	DCRE	; Get answer i.e. number of zeros to accumulator
	JNZ Loop	; Jump if no zero to Loop
	MOV A, C	; Qet answer i.e number of zero's to acc.
	STA 2601H	; Store the count in location 2601H
END	HLT	; Stop the processing

(b) Write an Assembly Language Program to find the largest number in a block of memory locations begins from 2400H, block length is stored at 23 FFH. Store the largest number after the end of the block. 5

Ans. :

Label	Instruction	Comments
START	LXI H, 23 FFH	; Address for count in HL pair
	MOV C, M	; Get count in reg. C
	SUB A	; clear accumulator
LOOP	INX H	; Go to address of next memory
	CMP M	; Compare memory with ACC
	JNC AHEAD	; No larger in ACC, go to label. AHEAD
	MOV A, M	; Get larger no. In acc
AHEAD	DCR C	; Decrement count
	JNZ LOOP	; Go to label loop
	INX H	; Increment memory location by 1
	MOV M, A	; Store result at memory location
END	HLT	; stop

(c) Write an Assembly Language Program to find absolute difference of two hex numbers stored in memory locations 2500 H and 2501 H. Store the result at 2502H. 5

Ans. :

Label	Mnemonics	Comments
	LXI H, 2500 H	; Set H-L pointer to 200 H
	MOV A, M	; Move 1st no. in Accumulator
	INX H	; Increment H-L pair
	SUB M	; Subtract 2nd no. form 1st no.
	JP GO	; If positive result, jump to GO
	MOV A, M	; Move 2nd no. in ACC
	DCX H	; Decrement H-L pair
	SUB M	; Subtract 1st no. from 2nd no.
GO	STA 2502 H	; Store result in 2502 H
	HLT	; Stop

OR

Q. 5 Answer any two of the following :

(a) Write an Assembly Language Program to exchange the digits of a number the digits of a number stored in C200H and add it to the original number. Store the result at C201H. 5

Ans. :

Label	Mnemonics and Operand	Comments
	LXI H, C200 H	; Set HL with C200 H
	MOV A, M	; Copy mem. To Acc.
	RRC	; Rotation right 4 time to
	RRC	; exchange nibbles
	RRC	;
	RRC	;
	ADDM	; Add memory content with acc.
	STA C201 H	; Store Acc to C201 H
	HLT	; Stop

(b) Write an Assembly Language Program to count number of times data D9H present in a memory block begins from C400H. The length of the block is stored at C3FFH. Store the result after end of the block. 5

Ans. :

Label	Mnemonics+ Operand	Comments
START	LXI H, C3FFH	; Initialize H-L pair with starting address
	MVI C, M	; Store count in register C
	MVI B, 00H	; Initialize occurrence count in register B.
	INX H	; Increment memory location by 1
LOOP	MOV A, M	; Get the number in accumulator
	CPI D9H	; Check whether the number in accumulator is D9H
	JNZ NEXT	; If no ? jump to label NEXT
	INR B	; Yes, increment content in register B by 1.
NEXT	INX H	; Increment H-L pair
	DCR C	; Decrement count
	JNZ LOOP	; Is count zero ? No-jump to label LOOP
	INX H	; Increment memory location
	MOV M, B	; Get count in memory
END	HLT	; Stop processing

(c) A block of data is stored in memory locations from C200H to C20FH. Write an Assembly Language Program to transfer the block in reverse order to memory locations C300H and onwards. 5

Ans. : Assembly language program :

Memory address	Label	Mnemonics	Comments
C000		LXI H, C200H	; set up HL as a pointer to source
C003		LXI D, C30FH	; set up DE as a pointer to destination
C006		MVI B, 10H	; set up B to count
C008	Loop	MOV A, M	; get data byte from memory
C009		STAX D	; Store data byte at destination
C00A		INX H	; Increment source pointer
C00B		DCX D	; Decrement destination pointer
C00C		DCR B	; Decrement count
C00D		JNZ Loop	; if not zero, go back
		HLT	; Stop

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July 2023

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	04	12	01	04	–	–	17
2	Instruction Set and Programming of 8085	01	01	02	06	02	08	06	30	45
3	Introduction to INTEL X-86 Family	–	–	01	03	01	04	–	–	07
4	Introduction of Microcontroller	01	01	02	06	-	-	–	–	07
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1(A) Select the correct alternative and rewrite the following :

(a) The 8085 Microprocessor can address ________ bytes of memory. **1**
 (i) 4 kilo (ii) 1 kilo (iii) 32 kilo (iv) 64 kilo

(b) The ________ instruction rotates contents of accumulator left through carry by one bit. **1**
 (i) RAL (ii) RLC (iii) RRC (iv) RAR

(c) The 8051 has contain ________ special function registers. **1**
 (i) 8 (ii) 16 (iii) 24 (iv) 22

(d) Ethernet network transmit data in small units called ________. **1**
 (i) byte (ii) nibble (iii) frame (iv) word

Ans. : (a) (iv) (b) (i) (c) (iv) (d) (iii)

Q. 1(B) Answer any two of the following :

(a) State any two advantages of computer networks. Distinguish between LAN and WAN. (Any four points) **(Ch. 5/Q. 7/Pg. No. 5-5)** **3**

(b) Define following terms in transmission media : **3**
 (i) Bandwidth
 (ii) Attenuation
 (iii) Immunity from electromagnetic interference **(Ch. 5/Q. 4/Pg. No. 5-2 and 5-3)**

(c) Write the use of following terms in functional block diagram of 8085 Microprocessor :
 (i) Serial I/O controller **(Ch. 1/Q. 34(v)/Pg. No. 1-22)**
 (ii) Timing and Control unit **(Ch. 1/Q. 5/Pg. No. 1-7)**
 (iii) ALU **(Ch. 1/Q. 35(a)/Pg. No. 1-22)** **3**

Q. 2(A) Answer any two of the following :

(a) Draw flag register diagram of 8085 Microprocessor. Interpret its meaning by taking your own example. **(Ch. 1/Q. 39)/Pg. No. 1-24)** **3**

(b) Draw a neat labeled memory map diagram for 8051 microcontroller.
(Ch. 4/Q. 5/Pg. No. 4-4) **3**

(c) State any three advance features of X-86 Microprocessor family.
(Ch. 3/Q. 11/Pg. No. 3-6) **3**

Q. 2(B) Answer any one of the following :

(a) Define STAR topology with diagram. Write its two advantages and disadvantages.
(Ch. 5/Q. 25/Pg. No. 5-16) **4**

(b) State any four addressing modes with one example each in 8085 Microprocessor.
(Ch. 2/Q. 2/Pg. No. 2-2) **4**

Q. 3(A) Answer any two of the following :

(a) Write any six features of 8085 Microprocessor. **(Ch. 1/Q. 7/Pg. No. 1-8)** **3**

(b) Define Software Interrupt. Write all vector addresses (call locations) of software interrupts. **(Ch. 1/Q. 23/Pg. No. 1-15)** **3**

(c) Write a note on complete microprocessor system (i.e. microcontroller)
(Ch. 4/Q. 1/Pg. No. 4-1) **3**

Q. 3(B) Answer any one of the following :

(a) After execution of following instruction in 8085 microprocessor mention which flag(s) gets affected : **4**

(i) INR M **(Ch. 2/Q. 14/Pg. No. 2-41) S, Z, P, AC except Cy**

(ii) DCX rp **(Ch. 2/Q. 18/Pg. No. 2-42)**

(iii) DAD rp **(Ch. 2/Q. 19/Pg. No. 2-42)**

(iv) CMA **(Ch. 2/Q. 17/Pg. No. 2-51)**

(b) Explain the advantages of Peritium Processor with respect to the following features : **4**

(i) Dual pipelining (ii) On chip caches

(iii) Branch prediction (iv) 64 bit data bus **(Ch. 3/Q. 8/Pg. No. 3-5)**

Q. 4(A) Answer any two of the following :

(a) Write addressing mode and length in bytes for following 8085 instructions : **3**

(i) ADI 2911 (ii) XCHG (iii) LDAX B

Ans. :

	Addressing mode	Length
(i) ADI 2911 **(Ch. 2/II(3)/Pg. No. 2-36)**	**Immediate**	**2 Byte**
(ii) XCHG **(Ch. 2/I(13)/Pg. No. 2-35)**	**Register/Implicit**	**1 Byte**
(iii) LDAX B **(Ch. 2/I(11)/Pg. No. 2-34)**	**Register/Indirect**	**1 Byte**

(b) Write single instruction in 8085 Microprocessor which clears (00H) the content of accumulator after execution. **(Ch. 2/Q. 5/Pg. No. 2-4)** **3**

(c) What is Router ? Explain its two types. **(Ch. 5/Q. 40/Pg. No. 5-25)** **3**

Q. 4(B) Answer any one of the following :

(a) What is Co-axial Cable ? Draw labeled diagram for it. State its two advantages and disadvantages. **(Ch. 5/Q. 8/Pg. No. 5-5)** **4**

(b) State functions of following pins in 8085 microprocessor : **4**

(i) $AD_0 - AD_7$ **(Ch. 1/Q. 17(ii)/Pg. No. 1-12)**

(ii) $A_8 - A_{15}$ **(Ch. 1/Q. 17(iii)/Pg. No. 1-12)**

(iii) $S_0 - S_1$ **(Ch. 1/Q. 11(3)/Pg. No. 1-10)**

(iv) V_{cc} and V_{ss}

Q. 5 Answer any two of the following :

(a) Write an assembly language program to find absolute difference of two hex numbers stored in memory locations 5002H and 5003H. Store the result at 5004H.
(Ch. 2/Q. 179/Pg. No. 2-159) 5

Ans. :

Label	Mnemonics	Comments
	LXI H, 5002 H	; Set H-L pointer to 5002 H
	MOV A, M	; Move 1st no. in Accumulator
	INX H	; Increment H-L pair
	SUB M	; Subtract 2nd no. form 1st no.
	JP GO	; If positive result, jump to GO
	MOV A, M	; Move 2nd no. in ACC
	DCX H	; Decrement H-L pair
	SUB M	; Subtract 1st no. from 2nd no.
GO	STA 5004 H	; Store result in 5004 H
	HLT	; Stop

(b) A block of data is stored in memory locations from 5004H. The length of block is stored at memory location 5003H. Write an assembly language program that searches for the first occurrence of data byte 2AH in the given block. Store the address of this occurrence in HL register pair. If number is not found then HL register pair must contain FFFFH.
(Ch. 2/Q. 72/Pg. No. 2-109) 5

Ans :

Label	Opcode Operand	Comments
START	LDA 5003 H	; Copy block length into accumulator
	MOV C, A	; Copy block length from accumulator to Reg C
	LXI H, 5004 H	; Load H - L pair with starting address
	MVI A, 2A H	; Initialise search element (AB) in register A
UP	CMP M	; Compare number in memory to the number ABH in accumulator
	JZ end	; Number in memory is AB ? Yes jump to end.
	INX H	; Increment H - L pair
	DCR C	; Decrement contents of block length counter Reg C
	JNZ UP	; Repeat all steps until all locations are checked
	LXI H, FFFF H	; Load H - L pait with address FFFF H
END	HLT	; Stop processing

(c) The 8 bit hex number is stored in register B if both nibbles are having same value then store 00H in accumulator else FFH in accumulator. **(Ch. 2/Q. 140/Pg. No. 2-141)** 5

Ans. :

Label	Mnemonics	Comments
	LXI H,D000H	; Load HL with D000 H
	MOV B, M	; move M to B
	MOV A, M	; Move M to Accumulator
	ANI OF H	; AND Immediate with Acc.
	MOV B, C	; Move A to C

	MOV A, M	; Move M to Acc
	ANI F0 H	; AND Immediate with Acc.
	RRC	; Rotate Acc. Right by 1 bit four times
	RRC	
	RRC	
	RRC	
	CMP C	; Compare B with Acc.
	JZ L1	; Jump if Zero to L1
	MVI A, FF H	; Move Immediate FF to A
	JMP L2	; Jump to L2
L1	MVI A, 00 H	; Move Immediate 00 H to A
L2	HLT	; Stop

OR

Q. 5 Answer any two of the following :

(a) Write an assembly language program using rotate instruction to divide the number in BC register pair by 2 and store result in HL register pairs. **(Ch. 2/Q. 64/Pg. No. 2-105)** 5

Ans :

Label	Mnemonics+ operand	Comments
START	STC	; Set carry — set carry to 0
	CMC	; complement the carry
	MOV A, B	; Carry MsBs to acc
	RRC	; Carry to MSB & LSB of higher order.
	MOV B, A	; Carry LSBs to acc
	RRC	; Rotate acc to right by 1
	MOV B, A	; move acc content to B reg.
END	HLT	stop processing

(b) Write an assembly language program that adds 4 byte integer stored in consecutive memory locations starring from C200H beginning with lower order byte to another 4 byte integers stored in consecutive memory locations starting from C300H beginning with lower order byte. Store the result in consecutive memory location starting from C200H. **(Ch. 2/Q. 143/Pg. No. 2-143)** 5

Ans. :

Label	Mnemonics Operand	Comments
	LXI SP, FF00H	; Initialize stack pointer
	LXI H, C200H	; Address of LSB of 2nd number
	LXI B, C3000H	; Address of LSB of 1st number
	STC	; Set carry flag
	CMC	; Reset carry flag
	XTHL	; Save the H-L pair in stack
	LXI H, 0004H	; Byte count in reg. L
BACK	XTHL	; Save count in stack and retrieve HL pair
	LDAX B	; Get byte of 1st number of accumulator
	ADC M	; Addition of byte of 1st and 2nd number

Label	Mnemonics Operand	Comments
	MOV M, A	; move A to M
	INX H	Get address of next memory locations
	INX D	
	INX B	
	XTHL	; Save H-L pair in stack and retrieve the count
	DCR L	; Decrement count by 1
	JNZ BACK	; Is all bytes are added if no-jump to Label BACK
	MVI A, 00H	; If yes, clear the accumulator
	RAL	; Get carry in accumulator
	MOV M, A	; mov A to M
	HLT	; Stop processing

(c) Write an assembly language program to convert a two digit BCD (binary Coded Decimal) number stored in memory location B204H into its binary equivalent and store the binary value in memory location B205H. **(Ch. 2/Q. 118/Pg. No. 2-130)** **5**

Ans. :

Label	Mnemonics	Comment
	LXI H, B204 H	; Initialize HL pair with B204 H
	MOV A, M	; Get data from M to A
	MOV B M	; Get data from M to B
	ANI OF H	; Logical AND with Accumulator
	MOV C, A	; Get data in C
	MOV A, B	; Get data from B to A
	ANI F0 H	; Logical AND with Accumulator
	RRC	
	RRC	; Rotate Accumulator four times right
	RRC	
	RRC	
	MOV D, A	; Get data from A to D
	MVI A, 00H	; clear Acc
	MVI E, 0A H	; set E = 0AH
UP	ADD D	; Add D with A
	DCR E	; Decrement E
	JNJ UP	; Jump if no zero to up.
	ADD C	; Add c with A
	INX H	; Increment HL A to M
	HLT	; stop

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March 2024

Distribution of Marks- Questionwise and Topicwise

Sr. No.	Name of Topic	1 Mark Question		3 Mark Question		4 Mark Question		5 Mark Question		Total Marks
		Nos.	Total	Nos.	Total	Nos.	Total	Nos.	Total	
1	Introduction to Microprocessors and organisation of 8085	01	01	04	12	01	04	–	–	17
2	Instruction Set and Programming of 8085	01	01	02	06	02	08	06	30	45
3	Introduction to INTEL X-86 Family	–	–	01	03	01	04	–	–	07
4	Introduction of Microcontroller	01	01	02	06	-	-	–	–	07
5	Networking Technology	01	01	03	09	02	08	–	–	18
	Total	04	04	12	36	06	24	06	30	94

Q. 1(A) Select the correct alternative for blank space and rewrite entire statement for the following :

(a) The invalid register pair in 8085 Microprocessor is ________. 1
(i) BC (ii) HL (iii) SP (iv) DE

(b) The length of instruction PUSH Rp is ________ byte(s). 1
(i) 2 (ii) 1 (iii) 3 (iv) 4

(c) 8051 is ________ bit microcontroller. 1
(i) 8 (ii) 4 (iii) 16 (iv) 32

(d) The device used to extent cable length of a computer network is __________. 1
(i) Modem (ii) Hub (iii) Repeater (iv) Router

Ans. : (a) (iii) (b) (ii) (c) (i) (d) (iii)

Q. 1(B) Answer any two of the following :

(a) Content of flag register of 8085 Microprocessor is 55H. Write its bit pattern and give interpretations. 3

Ans. : The content of flag register of 8085 is 55H.

= 0101 0101

Flag register	S	Z	–	AC	–	P	–	Cy
Given : 55H	0	1	0	1	0	1	0	1

In this also consider,

S = 0 = Reset = Accumulator content is +ve result

Z = 1 = set = Accumulator content is zero result

AC = 1 = set = Means there is carry generated from bit D_3 to D_4 during arithmetic operation

P = 1 = set = Means accumulator content even no. of 1's present

Cy = 1 = set = Means there is carry or borrow from most significant bit during the execution of arithmetic operation

(b) Explain the organization of ALU with the help of block diagram.
(Ch. 1/Q. 31/Pg. No. 1-20) 3

(c) Define Microcontroller. State any 4 advantages of same over microprocessor based system. **(Ch. 4/Q. 2/Pg. No. 4-2)** 3

Q. 2(A) Answer any two of the following :

(a) Identify 1-byte, 2-byte and 3-byte instructions from the following and write the same : 3

(i)	LDA CO40H	(ii)	ADC M
(iii)	CPI D4H	(iv)	ORI 9DH
(v)	XTHL	(vi)	LHLD 2060H

Ans. :

(i) LDA CO40H – 3 byte
(ii) ADC M – 1 byte
(iii) CPI D4H – 2 byte
(iv) ORI 9DH – 2 byte
(v) XTHL – 1 byte
(vi) LHLD 2060H – 3 byte

(b) List any six characteristics of transmission media. **(Ch. 5/Q. 1/Pg. No. 5-3)** 3

(c) State any three addressing modes of 8085 Microprocessor instructions with one example of each. **(Ch. 2/Q. 2/Pg. No. 2-1)** 3

Q. 2(B) Answer any one of the following :

(a) Explain the function of following pins of 8085 Microprocessor : 4

(i) $\overline{RD}$ **(Ch. 1/Q. 9/Pg. No. 1-9)**
(ii) HOLD **(Ch. 1/Q. 10/Pg. No. 1-10)**
(iii) RST 7.5 **(Ch. 1/Q. 11/Pg. No. 1-10)**
(iv) $\overline{INTA}$ **(Ch. 1/Q. 16/Pg. No. 1-11)**

(b) What is Ring Topology ? Draw neat labelled diagram to show Ring Topology. State one advantage and one disadvantage of Ring Topology. **(Ch. 5/Q. 24/Pg. No. 5-15)** 4

Q. 3(A) Answer any two of the following :

(a) Differentiate between UTP and STP cables. **(Ch. 5/Q. 13/Pg. No. 5-9)** 3

(b) What is Bus ? Explain address Bus and Data Bus of 8085 Microprocessor.
(Ch. 1/Q. 6/Pg. No. 1-7) 3

(c) State any two advantages and any one disadvantage of wireless media in networking.
(Ch. 5/Q. 43/Pg. No. 5-25) 3

Q. 3(B) Answer any one of the following :

(a) Explain following connectivity devices : 4

(i) Modem **(Ch. 5/Q. 37/Pg. No. 5-22)**
(ii) Hub **(Ch. 5/Q. 39/Pg. No. 5-23)**

(b) Consider Accumulator contains FFH and register C contains 4DH. Execute following instructions one after the other and write contents of Accumulator after each instruction:

(i)	XRA A	(ii)	ADD C
(iii)	CPI 4D H	(iv)	SUB C

4

Ans. :

(i) XRA A = 00H (ii) ADD C = 4DH
(iii) CPI 4D H = 4DH (iv) SUB C = 00H

Accumulator (A) = FFH = 1111 1111

Consider weight,

Register C ∴ 4D = 0100 1101

(i) XRA A

Accumulator = A = FFH	1111	1111
XRA = A = FFH	1111	1111
	0000	0000
	0	0

∴ After XRA A accumulator content = 00H

(ii) ADD C

Accumulator (A) = 00H	0000	0000
ADD C = 4DH	0100	1101
	0100	1101
	4	D

∴ After ADD C accumulator content = 4DH

(iii) CPI 4D H

Accumulator A = 4D	0100	1101
CPI = 4D	0100	1101
	1011	0010
	+	1
	1011	0011
+	0100	1101
Complement carry $\boxed{1}$	0000	0000
0	0	0

Cy = 0 and Z = 1

∴ After CPI 4D accumulator content = 4DH

Because of compare instant result not load in accumulator content remain unchanged.

(iv) SUB C

Accumulator A = 4D	0100	1101
SUB C = 4D	0100	1101
	1011	0010
	+	1
	1011	0011
Complement carry $\boxed{1}$	0100	1101
0	0000	0000
	0	0

∴ After SUB C accumulator content = 00H

Q. 4(A) Answer any two of the following :

(a) Differentiate between Hardware and Software interrupts of 8085 Microprocessor. (Any three points) **(Ch. 1/Q. 24/Pg. No. 1-16)** **3**

(b) State any six features of 8051 Microcontroller. **(Ch. 4/Q. 3/Pg. No. 4-2)** **3**

(c) Draw and label programming model of 80286 Microprocessor. **(Ch. 3/Q. 13/Pg. No. 3-8)** **3**

Q. 4(B) Answer any one of the following :

(a) List all conditional jump instructions of 8085 Microprocessor with the condition of flag, in each. **(Ch. 2/Q. 10/Pg. No. 2-7)** **4**

(b) Explain following features of Pentium Microprocessor : **4**

(i) Dual Pipeline (ii) On-chip cache

(iii) Branch Prediction (iv) 64-bit data bus **(Ch. 3/Q. 8/Pg. No. 3-5)**

Q. 5 Answer any two of the following :

(a) Write an assembly language program to multiply two 1-byte data stored at memory locations C600 H and C601 H respectively. Store the 16-bit result at locations C602 H and C603 H beginning with lower order byte of the result. **(Ch. 2/Program 3/Pg. No. 2-63)** **5**

Ans. :

Label	Mnemonics code	Comments
	LXI H , C600H	; Load HL pair
		; immediately
		; with C600H
	MOV D, M	; Move contents
		; of memory to
		; register D
	INX H	; Go to next memory
	MOV E, M	; Move contents of
		; this memory into
		; register E.
	XRA A	; Clear content of
		; Accumulator, (A) = 00H
	MOV B, A	; Copy (A) to (B)
Back :	ADD D	; Process of multiplication begins by
		; Adding 1st data into
		; Accumulator
	JNC skipcy	; Jump if cy – 0
	INR B	; count cy in B
Skip cy :	DCR E	; decrement loop
		; counter E, 2nd data
	JNZ back	; IF counter E ≠ 0
		; Jump 'back' to
		; Continue multiplication
	INX H	; Go to next memory

Label	Mnemonics code	Comments
	MOV M, A	; Copy lower data
		; byte of product
	INX H	; Go to next memory
	MOV M, B	; Copy higher data
		; byte of product
	HLT	; Halt all process

Note : RST 01 can be used and to be given equal credit, in place of HLT.

(b) Consider a block memory locations from C300 H to C30F H, another block from C400 H to C40F H. Write an assembly language program to exchange contents of these two blocks. **(Ch. 2/Program 5/Pg. No. 2-65)** 5

Ans. :

Label	Mnemonics code	Comments
	MVI B, 10 H	; Load block length
		; Immediately into B
	LXI H, C300H	; Initiales addr of 1st
		; block in HL pair
		; data accessible in mem.
	LXI D, C400H	; Addr of 2nd block is
		; initialized to DE pair.
		; mem (M) not used here
BACK :	MOV C, M	; data from 1st block into C
	LDAX D	; data of 2nd block into A
	MOV MA	; data from A into Mem
	MOV A, C	; data of C into A
	STAX D	; store A into 2nd block
	INX H	; Go to next mem of 1st block
	INX D	; Go to next mem of 2nd block
	DCR B	; decrement length counter
	JNZ Back	; If block length is zero
		; then done. If not, jump
		; back to start of loop
	HLT	; Halt the process
		;
		;

(c) Write an assembly language program to get Binary Coded Decimal (BCD) sum of series of 1-byte numbers stored at locations beginning 2600 H. Length of series is at 25FF H. Store the 1-byte result in 2700 H. 5

Ans. :

Label	Mnemonics code	Comments
	LXI H, 25FF H	; Load addr of block
		; Length in HL pair
		; Memory value in M

	MOV B, M	; Copy block length in B
	SUB A	; Clear (A) to 00H
Back :	INX H	; Go to next memory
	ADD M	; Add data into A
	DA A	; Convert into BCD
	DCR B	; decrease B by 1
	JNZ Back	; check z flag if z = 0
		; then jump back to
		; loop, i.e. B ≠ 0
	STA 2700H	; Store final 1-byte
		; Sum from A into memory
	HLT	; Halt the process

OR

Q. 5 Answer any two of the following :

(a) A series of 1-bute hexadecimal data is stored at memory locations from D600 H to D60A H. Write an assembly language program to replace each odd number in the series with data 00H. **(Ch. 2/Program 138/Pg. No. 2-140)** **5**

Ans. :

Label	Mnemonics code	Comments
	MVI B, OBH	; Move OB into reg. B
	LXI H, D600H	; Load D600 H in HL pair
Repeat	MOV A, M	; copy mem. into A
	RAR/RRC	; Rotate A right 1-bit
	JNC NEXT	; Jump if not cy
NEXT :	INX H	; Increment HL by 1
	DCR B	; decrement B by 1
	JNZ Repeat	; Jump on no zero
	HLT	; Halt the process

(b) Consider a block of memory locations beginning D600 H to D60F H. Write an assembly language program to find first occurrence of data byte A2 H, found HL pair must contain 0000H. **(Ch. 2/Program 72/Pg. No. 2-109)** **5**

Ans. :

Label	Mnemonics code	Comments
	MVI A, A2H	; Load A2H in A immd.
	MVI B, 10 H	; MOV 10 H in B immd.
	LXI H, D600H	; Load D600H in HL pair
Loop :	CMP M	; Compare A with M
	JZ END	; Jump on Zero
	INX H	; Increment HL pair
	DCR B	; decrement B by 1
	JNZ Loop	; Jump on no zero
	LXI H, 0000H	; Load 0000H in HL pair
End :	HLT	; Halt process
		;
		;

(c) A block of fifteen memory locations begins D200 H. Write an assembly language program to convert each data in the block into its 1's complement. Store the result at locations beginning D300 H. **(Ch. 2/Program 98/Pg. No. 2-120)** 5

Ans. :

Label	Mnemonics code	Comments
	LXI D, D300 H	; Load D300H in DE pair
	LXI H D200 H	; Load D200H in HL pair
	MVI B, 0F H	; Move of in B immd
Back :	MOV A, M	; Copy M into A
	CMA	; Complement ACI's
	STAX D	; Store A into memory via DE
	INX H	; Increment HL pair by 1
	INX D	; Increment DE pair by 1
	DCR B	; decrement B by 1
	JNZ Back	; Jump on no zero
	HLT	; Halt the process

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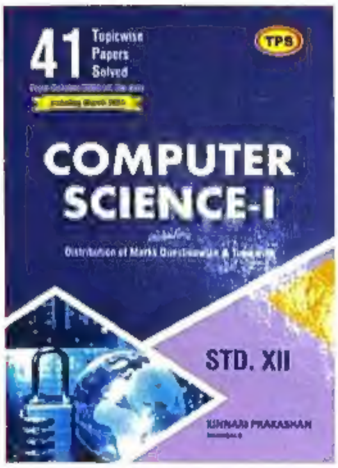
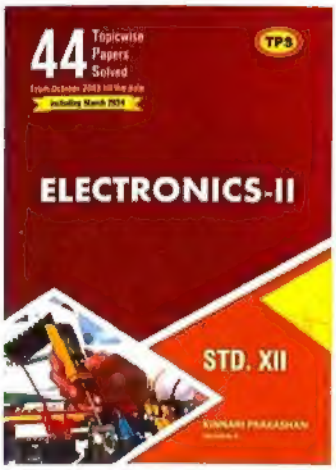
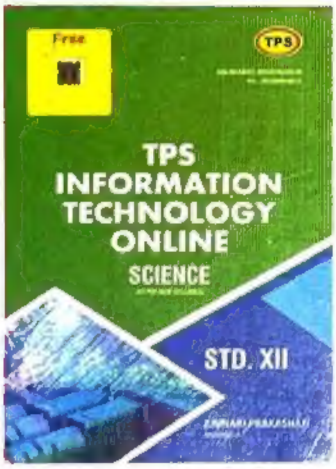
TPS

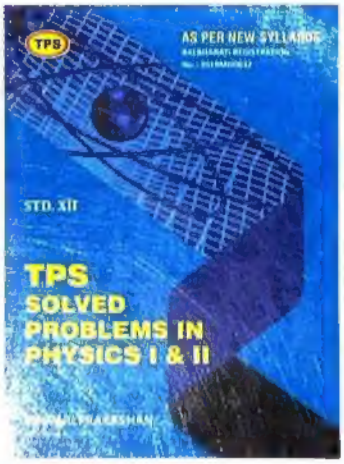
TPS BOOKS MEAN QUALITY BOOKS
QUALITY BOOKS MEAN TPS BOOKS

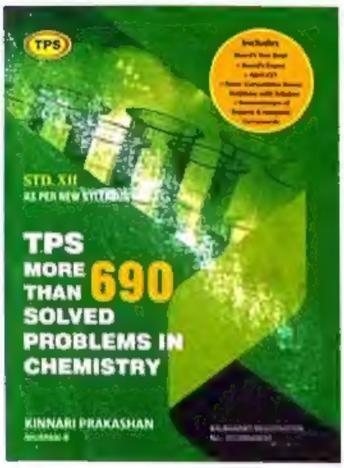
MOST USEFUL BOOKS FOR XII

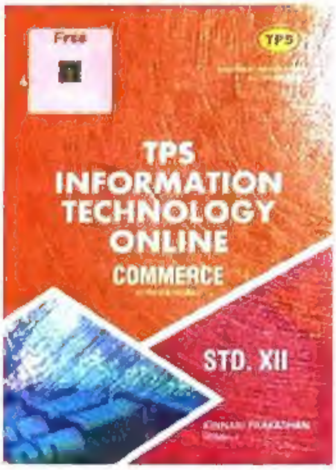


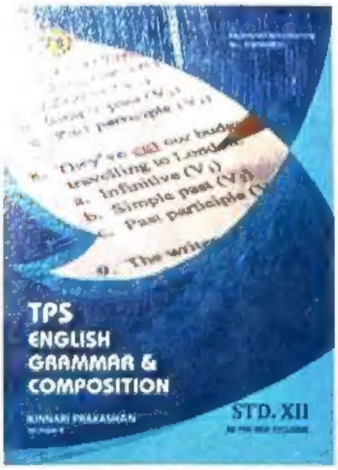


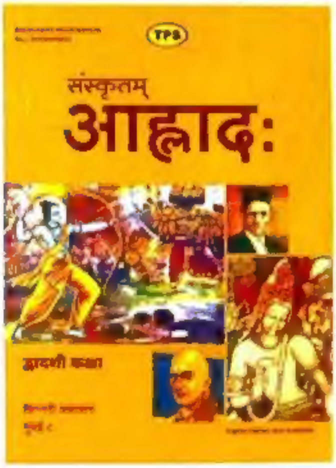












KINNARI PRAKASHAN, MUMBAI-8